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Malleable Cast Iron

Poor Qualities of Pure Cast Iron—The Factors That Make Malleable Cast Iron Superior—Soundness, Strength and Good Machineability Attained

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A NON-TECHNICAL article descriptive of any foundry product, in order to prove of real practical value to the general reader, must cover quite completely the details concerning the physical and structural characteristics of the product, the ease with which it can be machined, the facility with which it can be hot or cold worked, heat-treated or welded, and its cost. The commercial worth of any industrial product is determined not only by a consideration of these various characteristics, but by a rigid comparison of these properties with those possessed by such products as could be commercially substituted for it.

There are reasons, however, why it will best serve our purpose to consider first what these properties may be in the case of pure iron if it is used as a casting material. With this data in hand, and with some essential preliminary explanations, the reader will be in a position to exercise his own judgment in sizing up the advantages or shortcomings of the malleable iron casting as compared with the products that might be used commercially in its stead. He will be in a position as well to gather an intelligent idea as to the field to which this casting is best adapted.

According to various authorities, pure iron has an average ultimate strength of about 50,000 lb. per sq.in., accompanied by an exceedingly high ductility. Owing to the absence of carbon or phosphorus, the two elements that impart fluidity, this metal is extremely sluggish when molten. Structurally, pure iron when cast is made up of an aggregate of coarsely crystalline grains, as the microphotograph in Fig. 1 shows. While these grains are typical in form, their size will depend upon the rate of cooling from solidification. Therefore, it follows that if two castings of equal length but of different sized sections are poured from a ladle of pure molten iron, the crystalline structure of the heavier casting will be larger than that of the lighter, in proportion to the disparity in section.

Thicker the Section, Larger the Grain

As it is in rare cases only that castings are designed with uniform sections throughout, it follows that the crystalline structure of the thicker sections will be larger than that of the thinner sections, owing to the fact that the thicker sections cool more slowly than do the thinner ones. Not only is a coarsely crystalline structure unreliable in service, but internal strains are unavoidably developed in the casting, occasioned by the difference in the rate of cooling of the heavy and light sections. These strains are frequently of such magnitude as to cause the casting to crack either when cooling or when subjected to any slight strain in service. The more uneven this structural state is, the greater is the probability that these troubles will occur.

Experience has shown that if such a casting as we have just described is placed in an annealing oven and heated to around 900 deg. C. for a short interval of time and then slowly cooled, the defects in the structure will be modified. Not only will the coarsely crystalline grains in both the thick and thin sections be changed into ones very minute and uniform in size throughout all sections, but the internal strains which were occasioned by the difference in the rate of cooling of the disproportionate parts, will be removed.

Pure Iron Castings Commercially Inferior

Without entering into complete details, it can be stated that in the case of all of the various ferrous products to which we will refer, there exists a certain temperature at which the metal ceases to be magnetic. The constitutents that exist and are stable below this temperature change into others wholly different and stable only while above it. A coarsely crystalline structure can be broken up and replaced by one that will be permanent, very minute, and most reliable for the particular product in question.

In spite of what has been stated, castings of pure iron cannot be produced successfully or commercially for either structural purposes or for the construction of machines. On the one hand, they would be prohibitory in cost, while on the other, even if they were cheap, the lack of fluidity of pure iron when molten would occasion high loss due to mis-runs. The contraction after solidification is so great that any casting of intricate design would crack and pull apart at the junction of the thick and thin sections. A further handicap would lie in its high melting point, to which must be added several hundred degrees of superheat in order to raise the metal to a proper casting temperature.

Poor machineability, a characteristic of all soft metals such as copper and aluminum, is another shortcoming of pure cast iron. The castings would be unsound due to the blowholes which are very pronounced for such sluggish metals. The welding properties of such material are the best of any ferrous product, while it can be hot or cold worked with the greatest facility. The foregoing has been entered into in order to explain certain facts that could be more clearly brought out by a consideration of the characteristics of this metal whose casting properties could hardly be worse.

The main difference between pure iron and steel is that the latter must contain at least some carbon in order that it can be thus classified. The effect of adding carbon to pure iron manifests itself in an increased

tensile strength, a lessened ductility and an increased hardness, each in proportion to the amount of carbon added. The reason for these results lies in the fact that carbon does not remain as such when added to molten iron. As soon as carbon is added, it combines chemically with about fifteen times its weight of iron to form an intensely hard compound of definite composition called "carbide of iron"; and this notwithstanding the fact that one constituent is very soft and the other comparatively so.

But it happens that, some time after the metal has solidified, this very hard carbide of iron refuses to remain by itself and gathers unto and attaches to itself about eight times its weight of iron. As a result a mechanical mixture of definite composition is built up through the union of the two. A distinct constituent is created, which, while not quite as hard as carbide of iron, is much stronger and more ductile, although it is less ductile than pure iron.

It should now be plain to the reader why an exceedingly small amount of carbon added to pure iron can have such a profound effect on the physical characteristics of the latter. This can be illustrated by the use of concrete figures. If to pure iron such a trivial amount of carbon as 0.1 per cent be added, two reactions will take place. First, there will be formed from this 0.1 per cent of carbon about 3 per cent of iron carbide. Second, after solidification and at about redness, this 3 per cent of iron carbide will unite with about 8 times its weight of iron to form about 12.5 per cent of the mechanical mixture known as "pearlite." In Fig. 2 is shown a microphotograph of steel containing about 0.12 per cent carbon. The white areas are the carbonless iron and the dark areas the pearlite. Fig. 3 shows a microphotograph of the structure of a steel which has a 0.34 per cent carbon content.

Not only does carbon when introduced into pure iron produce the far reaching effects noted, but it also has a marked influence on the melting point of the metal and on its fluidity and contraction. This is the case to such an extent that very superior castings could be made of this very pure steel, which would have a strength, ductility and hardness very easily adjusted by the carbon content. However, it happens that commercially, castings cannot be made of pure iron and carbon, because of the great expense that this would entail.

Commercial steel is always contaminated with a greater or less percentage of phosphorus, sulphur, manganese and silicon, the first two being very harmful when in excess of a certain quantity. Consequently, its freedom from the first two chemicals is a measure of the quality of commercial steel. Its carbon content, owing to its influence on the physical characteristics of the metal, actually determines its appropriateness for this or that particular purpose. For this reason carbon is not considered in the light of an impurity, but as a blessing.

The American Society for Testing Materials grades steel castings into Class *A* and Class *B*. With reference to those of Class *A* which, the writer can state, predominate by a considerable amount in tonnage, it is provided that they need not be annealed unless so specified. While no physical requirements have to be complied with, it is required that the carbon and the phosphorus should not exceed 0.30 per cent and 0.06 per cent, respectively.

In the case of Class *B* castings, it is provided that in all cases they shall be properly annealed, depending upon their design and composition. This class is graded into soft, medium and hard, having, respectively, minimum ultimate strengths of 60,000, 70,000 and 80,000 lb. per square inch. The yield point in each case should be at least 45 per cent of the ultimate strength. The elongations should not be less than 22 per cent, 18 per cent and 15 per cent, while the reductions of area should not be less than 30 per cent, 25 per cent and 20 per cent, respectively. In regard to

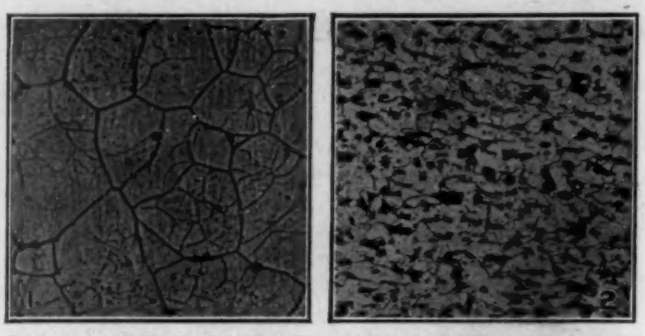


FIG. 1—MICROPHOTOGRAPH OF PURE CAST IRON, SHOWING THE COARSE CRYSTALLINE GRAINS. FIG. 2—MICROPHOTOGRAPH OF STEEL CONTAINING 0.12 PER CENT CARBON, SHOWING THE CARBONLESS IRON AND PEARLITE

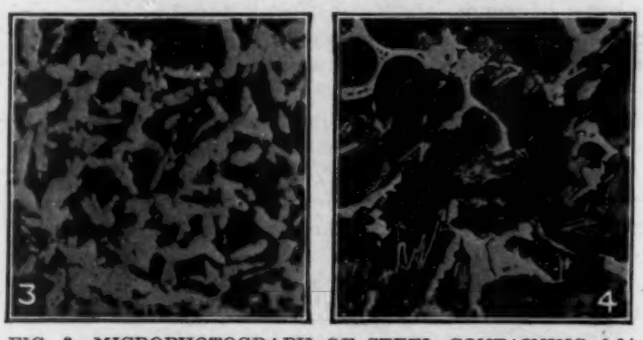


FIG. 3—MICROPHOTOGRAPH OF STEEL CONTAINING 0.34 PER CENT CARBON. FIG. 4—MICROPHOTOGRAPH OF HARD IRON, SHOWING CARBIDE AND PEARLITE

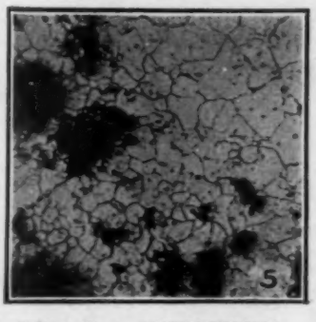


FIG. 5 — MICROPHOTOGRAPH OF MALLEABLE CAST IRON AFTER ANNEALING

composition, it is specified that both the phosphorus and the sulphur content must be less than 0.05 per cent.

No better casting exists than a sound, high-grade steel casting, and the remarks that follow are not intended to offset or negative this statement in any particular. All products have certain properties that make them superior to others, while on the other hand they have other characteristics that would make the reverse statement equally true.

It has been pointed out that Class *A* castings predominate in tonnage and that they do not need to be annealed unless so specified. It can be stated then that, with this privilege allowed, not all such castings receive annealing treatment. It has been pointed out also that under these conditions the crystallization must be coarse in proportion to the size of the sections, as well as different in size in disproportionate sections, while internal strains must be present for reasons already

explained. In spite of this there is a large sale of Class *A* castings, even when they are unannealed.

It has been explained that the hardness of steel is a function of the carbon content. Inasmuch as quantity production is one of the essentials insisted upon by our manufacturers, it will be found that they will purchase in preference a low rather than a high limit of carbon for Class *A* castings. Exception is made to this, however, for special parts where high strength is needed, and on this account the ease of machining is sacrificed. This will mean a product that will probably not be higher than 0.15 per cent in carbon. Even with a carbon content as low as this, these castings will have a machining cost far in excess of what would be necessary in the case of malleable cast iron.

Melting and Pouring Malleable Cast Iron

Malleable cast iron is made by melting together a certain proportion of pig iron, sprew and low-carbon scrap of the proper composition. The molten metal is allowed to remain in the furnace under the oxidizing influence of the furnace atmosphere, until a cast test-sprew, when broken, shows a uniformly white fracture free from any particles of graphitic carbon, or, in other words, until all of the carbon in the metal is in chemical combination with the iron. If this condition is reached, and if the molten metal is hot enough to pour the castings without the danger of mis-runs, the furnace is ready to be tapped.

Castings made from such iron are of extreme brittleness and hardness, and except in rare instances where such properties are actually desired, would serve no useful purpose. The structure of this hard iron is made up wholly of the two very hard constituents, carbide of iron or cementite and the mechanical mixture known as pearlite. This structure has been microphotographed, as shown in Fig. 4. The white areas that stand in relief are the carbide and the dark areas the pearlite.

Before proceeding let us note other characteristics possessed by this hard iron, the composition of which will average about 0.85 per cent silicon, about 2.40 per cent carbon, about 0.18 per cent phosphorus, 0.07 per cent sulphur and 0.25 per cent manganese. We have seen that both carbon and phosphorus, in the order named, impart great fluidity to iron, and that they act as well to lower its melting temperature. The melting point of pure iron is about 1,500 deg. C., and that of steel castings such as can be machined with fair ease for steel, is around 1,460 deg C. Hard iron of the composition referred to will have a melting range between 1,130 and 1,275 deg. Centigrade.

Comparative Freedom From Blowholes

From the foregoing we must conclude that this character of metal is one that is much easier and safer to cast than either pure iron or steel, both on account of its greater fluidity and its far lower melting point. It has been shown that the higher the melting range of a ferrous product, the greater will be the amount of gas absorbed. Consequently, the greater will be the danger from the presence of blowholes, not alone due to the larger quantity of gas absorbed, but more particularly to the sluggishness of the metal.

Of all the defects to which castings are prone, the most serious are due to blowholes. On the one hand, it is impossible to ascertain the presence of blowholes except by the destruction of the casting itself. On the other hand, if a considerable amount of machining be done on castings that must be rejected subsequently due to these defects, the monetary loss will be great. In the case of steel, ferro-silicon and aluminum are the alloys generally used to produce soundness.

It can be safely stated that without the addition of some alloy to take care of the occluded gases, the soft steel casting would not be a commercial product. White iron, or hard iron as it is called in the vernacular of the foundry, contains an average of about 0.85 per cent silicon and 2.45 per cent carbon as cast. No alloys are ever added for the prevention of blowholes, as hard iron is practically free from this evil. This does not mean that blowholes never exist in the malleable iron casting, for such is possible due to bad molding practice, the blowing of a core or damp sand—accidents that may happen in the case of any cast product. It does mean, however, that only in very rare cases are they ever caused by occluded gas.

It, therefore, can be accepted as a fact that hard iron is essentially a sound metal. The contraction of white iron is not only somewhat less than that of steel, but from the evidence furnished it is clearly a metal of much greater fluidity and of lower melting range. From this, it follows that unsoundness due to shrink is much more liable to occur in the latter than in the former metal. On the other hand, it is only fair to state that, while the presence of shrink is highly objectionable in either product for obvious reasons, if the product is to be machined a shrink will prove more objectionable in malleable cast iron than in steel, for in the former a hard area will always accompany a shrink while in the latter this is not the case.

Annealing Malleable Cast Iron

After the hard iron castings have been cleaned, they are packed in tightly sealed pots in which they are surrounded on all sides with a slightly oxidizing packing. The pots are then placed in an annealing oven, heated to about 850 deg. C., at which temperature they are held for a period of not less than 60 hours. From this temperature they are allowed to cool at a rate that will not exceed about 10 deg. per hour until the temperature of the castings has dropped to about 600 deg. C., after which the rate of cooling can be considerably increased.

It should be noted that the very temperature that is required for annealing the hard iron castings coincides with the temperature at which the grain is refined. A coarsely crystalline malleable iron casting therefore is quite a practical impossibility. What takes place during this annealing and conversion process can be gathered from a comparison of the microphotograph of hard or white iron shown in Fig. 4 and the microphotograph of the annealed product shown in Fig. 5.

It has been pointed out that hard iron is made up wholly of two very hard constituents, cementite and pearlite. Now, while this is true, it must not be forgotten that the cementite existing as such, and the cementite in pearlite, consist of the chemical union of very soft carbon and soft iron. During the heat treatment of the castings, the chemical union is disrupted. The carbon is forced to separate out in small rounded nodules, leaving the carbonless iron as a ground mass throughout which these segregated particles of soft carbon are uniformly distributed.

The malleable process therefore consists first in melting a cast-iron mixture in such a manner that the

carbon and iron unite to form a very hard and brittle product, and then in subjecting this product to the influence of temperature and time, whereby the hard constituents are forced to break up into the two original soft ones.

As can be seen by a comparison of the accompanying microphotographs, malleable cast iron has a structure unlike either that of pure iron or of steel. Were we to ignore certain facts, we might state that its structure could be likened to that of pure iron if rounded nodules of carbon were uniformly distributed throughout the structure of the latter. We might also state that the structure of a steel casting would be similar to that of pure iron if the particles of pearlite were located at

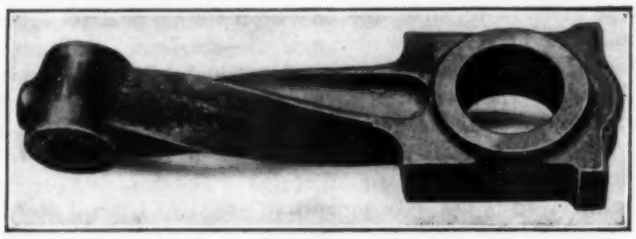


FIG. 6—A CONNECTING ROD OF MALLEABLE CAST IRON WHICH HAS BEEN GIVEN A 180-DEG. TWIST TO ILLUSTRATE THE ABUSE THIS PRODUCT WILL STAND

the junction of the grain boundaries. While such indeed might be the hasty conclusion, there are certain essential facts that must be considered before one can obtain the correct point of view.

If to a ladle of pure iron there is added the same amount of silicon, phosphorus, sulphur and manganese as normally exists in malleable cast iron, but no carbon, and if the structure of this metal is compared with that of pure iron, it might be quite impossible to tell which was which from a comparison of their microphotographs. This is because silicon has the property of alloying with iron with such intimacy that even under the highest magnification one cannot be differentiated from the other. It would be impossible to tell the amount of phosphorus used, while the sulphur and manganese, having reciprocal attraction, unite together to form a light slag, which, if given the opportunity, will float to the top of the molten metal. If the metal is too sluggish to admit of its escape in this manner, the slag will be entrained in the casting in the form of rounded particles of indefinite shape that can then be seen and identified.

There will be a marked difference, however, in the physical properties of pure iron and the pure iron to which these particular impurities have been added. The addition of silicon will facilitate machineability to such an extent that this can take place at high speed. The strength will be increased without an appreciable sacrifice of ductility. The phosphorus will increase the stiffness, facilitate machineability but decrease ductility to some extent. The sulphide of manganese will be inert, unless it is present in a prohibitory amount.

From the foregoing it can be stated that while the structure of pure iron consists wholly of ferrite (carbonless iron), and the ground mass of the malleable iron casting also of ferrite, in that it is also carbonless iron, the physical properties of these two types of ferrite are wholly different. This distinction is not always made by writers on this subject.

These matters have been entered into in tedious detail, because the writer has been asked so often by even metallurgists of long experience, how it is possible that malleable cast iron consisting of a ground mass of ferrite so closely resembling the structure of pure iron, but weakened by the presence of particles of free carbon distributed throughout it, can have an ultimate strength considerably superior to that of the latter. In addition, many who use these castings fail to understand why they can be machined at such high speed with an almost perfect surface, while the machinability of pure iron, or iron almost pure like high-grade wrought iron, is so poor, and the machined surface so rough.

Characteristics of Malleable Cast Iron

Malleable cast iron is a product that is very unique in many ways. As has been explained, it is made from a white cast iron that is very fluid when molten, that melts at a temperature slightly lower than grey iron, and that is very sound when cast, each and all of which are characteristics that make for general integrity of product. The castings are not only very tough and strong, but they can be machined at a much higher speed than is possible in the case of any other ferrous product, and they have a machined surface that is smooth and of close texture. These castings cannot be welded and in this particular the soft steel casting is superior. They cannot be improved by heat-treatment.

Lest the reader be confused, it will be explained that malleable cast iron is a product that has the special characteristics of great toughness and of comparatively high strength accompanied by machining properties that can be excelled only by brass or some other non-ferrous alloy. While steel can be heat-treated in such a manner as to make it capable of standing a much higher strength

The American Malleable Castings Association

CERTIFICATE

This Certifies that

has submitted daily test bars representing its product for the

of said plant is such as to p[illegible] uniform material of high character and integrity.

Executed on behalf of the Association at Albany, New York,

this day of , 19

Attest:

FIG. 7—CERTIFICATE ISSUED TO FIRMS WHOSE PRODUCTS HAVE PASSED THE A.S.T.M. REQUIREMENTS

than when in its raw state, this will be at the cost of ductility on the one hand and, to a much greater extent, of lessened machineability on the other. Malleable cast iron cannot be thus manipulated, and its use is applied to those cases in which the part is designed to stand great abuse in service and where maximum production is a prime essential. For such use it has no rival.

While there is no limit to the smallness of the casting that can be made, it is recommended that castings with sections in excess of 2½ in. or over 5 ft. long should not be made of this material. In Fig. 6 can be seen a fairly heavy casting, a connecting rod, that has been given a 180-deg. twist by way of illustrating the abuse this product will successfully withstand.

While some writers intimate that grey iron casting is a competitor, a perusal of the data which follow, in connection with the ultimate strength and elongation of

malleable cast iron, will correct this impression. Grey iron that is capable of being machined with anywhere near the facility of malleable cast iron will not exceed about 20,000 lb. per sq. in. ultimate strength, accompanied by no elongation whatsoever.

The writer is in a position to speak authoritatively in connection with the physical properties of malleable cast iron, its manufacture, the conditions of plant personnel, and the improvements that have taken place in the quality of this product during the past seven years. Not only has the product been improved in ultimate strength and ductility each year during this period, but the plants have been improved both in personnel and metallurgical apparatus, until in the case of the plants referred to little has been left undone in the way of scientific control that would make for uniformity of product.

A certificate, shown in Fig. 7 is issued each quarter to those whose product has passed the A.S.T.M. requirements. This certificate is granted after a daily test of test bars and an examination of the castings at each plant by an inspector attached to the engineer's office of these seventy plants who have co-operated to carry out this and other work of mutual interest. This certificate entitles the recipient to market "Certified Malleable Iron Castings," a product that is guaranteed to equal or exceed material that will stand up to the A.S.T.M. specifications that have just been discussed.

The uses to which these castings are put are many. The railroads, the agricultural implement manufacturers and the automotive industry are all high consumers of these castings, which are manufactured into machines of many types.

During the past three years, the average ultimate strength and elongation of the seventy different plants to which we have referred have been over 53,000 lb. per square inch and 15 per cent, respectively. The last complete monthly record in the writer's possession is that of August of last year. Some individual records during this month which may prove of interest by way of illustrating what some of the certificate holders can accomplish, are given in the following table.

Ultimate Strength Average, Pounds per Square Inch	Elongation per Cent
56,393	24.78
56,248	23.91
56,094	24.50
58,906	23.34
54,023	23.44

The average of eight others was 55,120 lb. ultimate strength and 20.27 per cent elongation. The yield point in these samples averaged about 33,000 lbs. per square inch. These results are very remarkable in a metal that can be machined at such high speed.

Matching the Wire With the Work

By E. Wanamaker
Electrical Engineer, Chicago, Rock Island & Pacific Railroad

Many tests tend to confirm what has been the general belief that the metal passing from the end of the electrode into the weld is in a highly molten state, with a generous proportion of it in a gaseous state and, therefore, extremely susceptible to atmospheric effects, even though the time of exposure to the atmosphere in this state be of short duration. By the use of such coated electrodes as are used on the Rock Island lines (and which it might be well to say, were only developed after years of experience and patient research, laboratory and service tests), we were able, to a large degree, to greatly minimize this damaging effect. By such protection of the metal in fusion, not only has it been possible to protect the iron and low carbon steel materials, but to go further and protect many of the various alloys, the use of which is extremely desirable to meet certain conditions, such alloys as nickel, vanadium, manganese and others.

Electrodes to have any real value must be very carefully produced to meet the necessarily exacting specifications, which in turn were only possible as a result of the combined prolonged efforts of those engaged in scientific research, development and application.

To produce such electrodes some expense is incurred over and above the production of mere wire, but in this and in no other way is it possible to produce an electrode of the proper composition and with the proper welding characteristics to meet the various requirements. A comparison of high-grade electrode costs with cost per pound of high grade steel castings, etc. (long ago deemed necessary) causes one to marvel at the low cost of good electrode material. It would seem reasonable to believe that we could no more secure good electric arc welds with poor or unsuitable welding material than we could expect to build machinery or structures out of poor or unsuitable material.

The necessity for welding materials of different composition to make possible productions of welds of various characteristics as desired to meet the service requirements, has been recognized for some time in oxy-acetylene welding. Yet there are many users of electric arc welding who endeavor to apply welding to different metals, each of a different analysis, using only one grade of electrode material. This should not be construed to mean that the composition of the welding electrode should in all cases be the same as the base metal. As stated above, the service requirements will determine the character of the weld metal desired.

For example, cast-iron electrodes have recently been used to build up worn cast-steel chafing plates between engine and tender of locomotive. The cast iron was simply deposited on the steel casting and allowed to cool normally, the rate of cooling being sufficiently quick to effect the formation of white cast iron, which is extremely hard, but especially suited for the service mentioned.

Examples of welding applications where the use of an electrode of an analysis or character approximately that of the base material has been found desirable or necessary to the success of the operation, are those of welding vanadium steel locomotive frames, where vanadium steel electrode material is used; or in the case of building up worn steel car wheel flanges where the wheel was slightly preheated and the flange built up with a high carbon steel material. In each case the weld metal is of similar character to the part welded.

The desirability of electrode materials to better facilitate electric arc welding of the different metals and to meet the diversified service requirement in repair and construction work, is recognized by many, but the fact remains that the use of such materials is not generally practiced, even in cases where their use would do much to give electric arc welding the standing it deserves.

From Journal of the American Welding Society, July, 1922.

A Modern Gear Cutting Shop

Survey of Various Departments—Floor Plans Show Arrangement of Stock Room and Machines—Details of Construction and Other Data

By FRED H. COLVIN
Editor, *American Machinist*

THE shop of the Central Gear Works, which is a highly specialized plant belonging to the General Motors Co., was designed and equipped for producing differential gearing for a number of the cars built by the General Motors Co. It is located on what is known as the Holbrook property in the City of Detroit, but is far enough from the business center to give ample room in a single-story shop for all the space needed. It covers 360 by 570 ft., excluding the two-story office along the 360-ft. front.

Some idea of the construction and the excellent light distribution which is obtained by the use of the saw-tooth roof can be had in Fig. 1. This illustration shows a view down the center aisle, the long way of the shop, and the photograph was taken from the office end. The columns are placed on 30-ft. centers in one direction and on 40-ft. centers in the other direction, the longer spacing being in the direction parallel with the saw-teeth.

This shop is remarkably well lighted and is a particularly pleasant place in which to work. The radiators for heating are supported above the beams which run parallel with the saw-teeth, and are entirely out of the way. The artificial lighting is by the mercury vapor lamps shown. This view also shows the department numbers prominently displayed, the foremen's desks and stools and at the right the gravity track system.

A plan view of the shop is shown in Fig. 2, which gives an idea of the machine-tool layout, and from which the progress of the work from department to department can be fixed. The bar stock comes from an outside track and is stored in the space shown in the upper left-hand corner of the plan. A Napier bandsaw is located in this department so as to cut up stock as it may be needed by any of the machines. The stock rack is so extremely interesting that it will be shown in detail in another article.

In order to give a general idea of the equipment, the various kinds of machines have been lettered according to the list herewith. The size of motor on each, for this is entirely an independent-motor-driven shop, follows the name of the machine. The sequence of the machines listed is simply from top to bottom of the illustration and bears no relation to either the size of the installation or the importance of the particular machine. The list follows:

A. Gridley screw machines	10	hp. each
B. Gridley automatics	3	hp. "
C. Foote-Burt drilling machines	7½	hp. "
D. Avey drilling machines	¾ and 1	hp. "
E. Reed-Prentice lathes	5	hp. "
F. Baker drilling machines	7½	hp. "
G. LaPointe broaching machines	7½	hp. "
H. Hartness automatics	13	hp. "
I. Fay lathes	7½	hp. "
J. Cincinnati-Bickford drilling machines	1½	hp. "
K. Bullard Multaumatics	10	hp. "
L. Natco drilling machines	15	hp. "
M. Foster turret lathes	9	hp. "
N. Gleason gear cutting machines	3	hp. "
O. Brown & Sharpe grinding machines	7½	hp. "
P. Barber-Colman gear hobbing machine	5	hp. "
Q. Bullard vertical turret lathes	7½	hp. "
R. Gould & Eberhardt gear roughing machines	10	hp. "
S. Van Norman grinding machines	3	hp. "
T. Heald grinding machines	2	hp. "

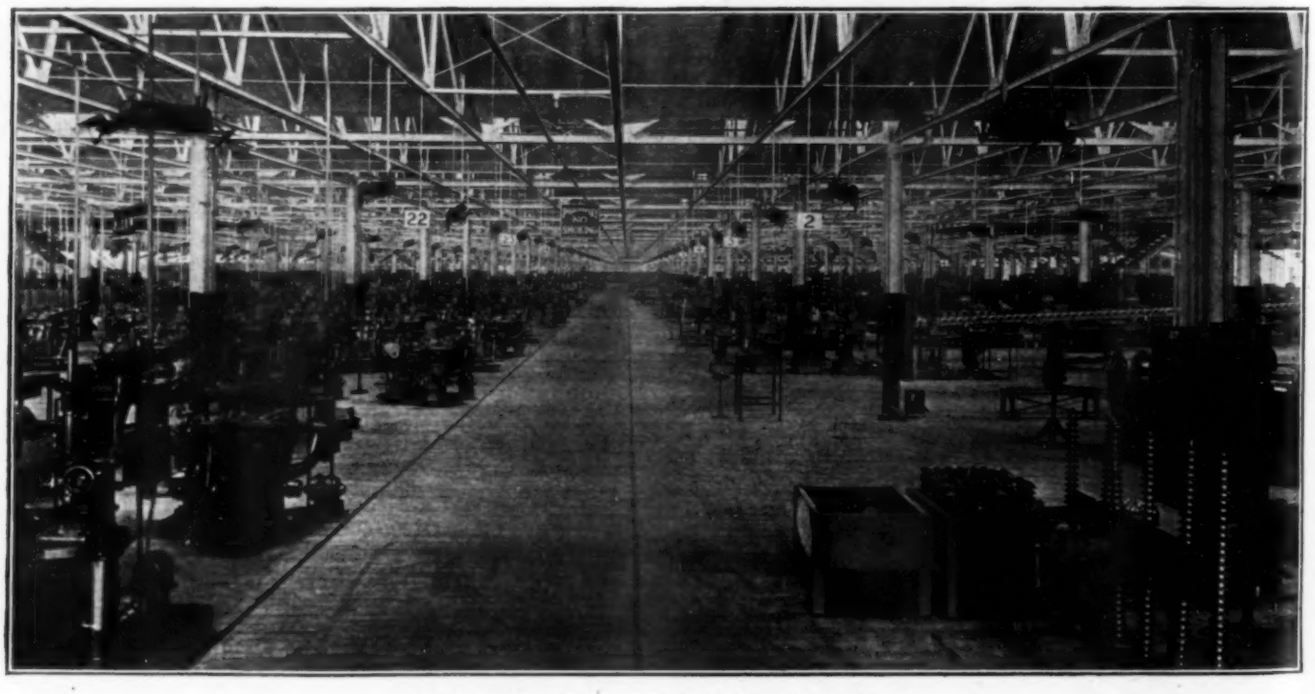


FIG. 1—THE CENTER AISLE OF THE SHOP

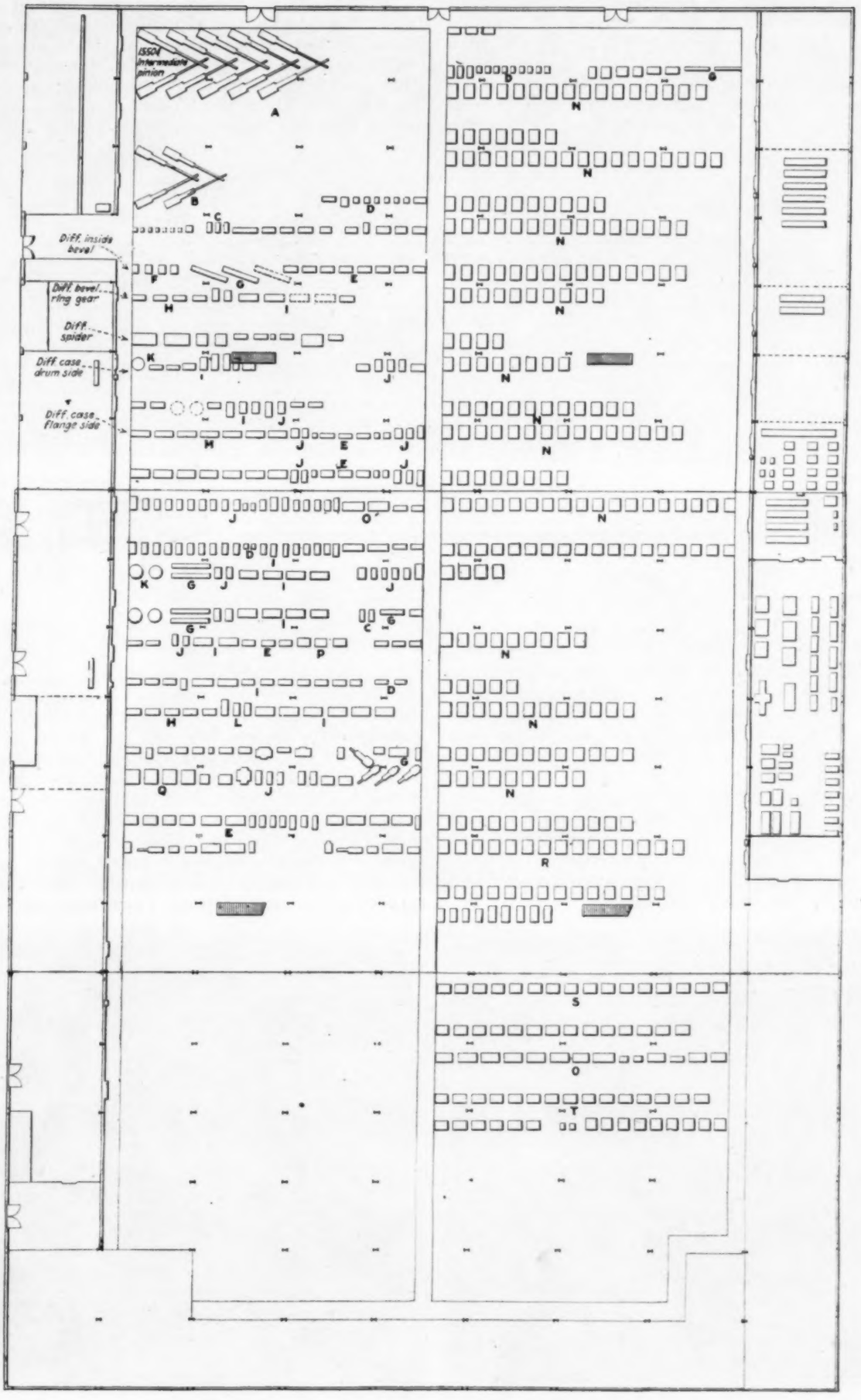


FIG. 2—FLOOR PLAN OF SHOP, SHOWING MACHINE TOOL LAYOUT

With this grouping of the machine-tool equipment in mind, a careful study of the whole shop layout is interesting to those responsible for production on a large scale.

A partial elevation of the front of the office building is shown in Fig. 3. It presents a very attractive appearance from the street and completely hides the shop behind it. A cross-section is shown in Fig. 4,

The photographic illustrations show some of the different departments, and give an excellent idea of many details of the shop layout, such as the arrangement of electric conduits for bringing power to the different machines, the grouping of the machines themselves, the space between them, the kind of drip pans and water guards used and other items of interest to the factory executive.

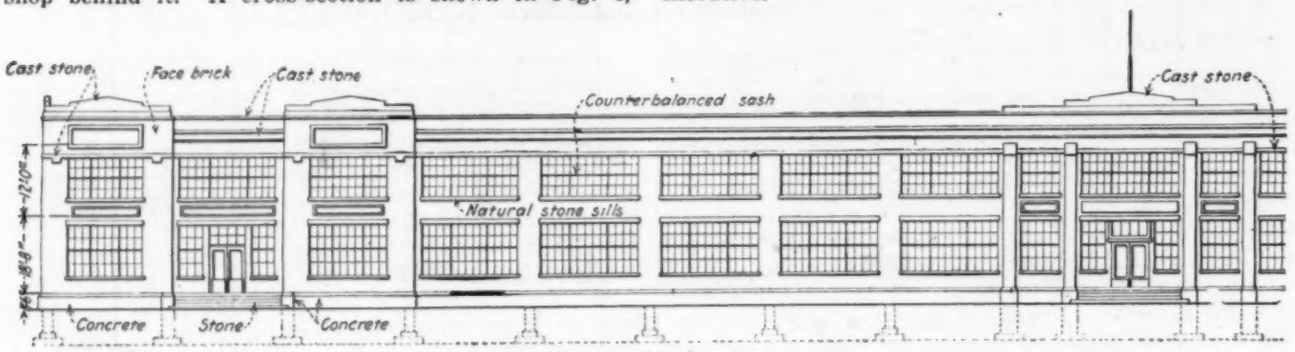


FIG. 3—PARTIAL ELEVATION OF OFFICE BUILDING IN FRONT

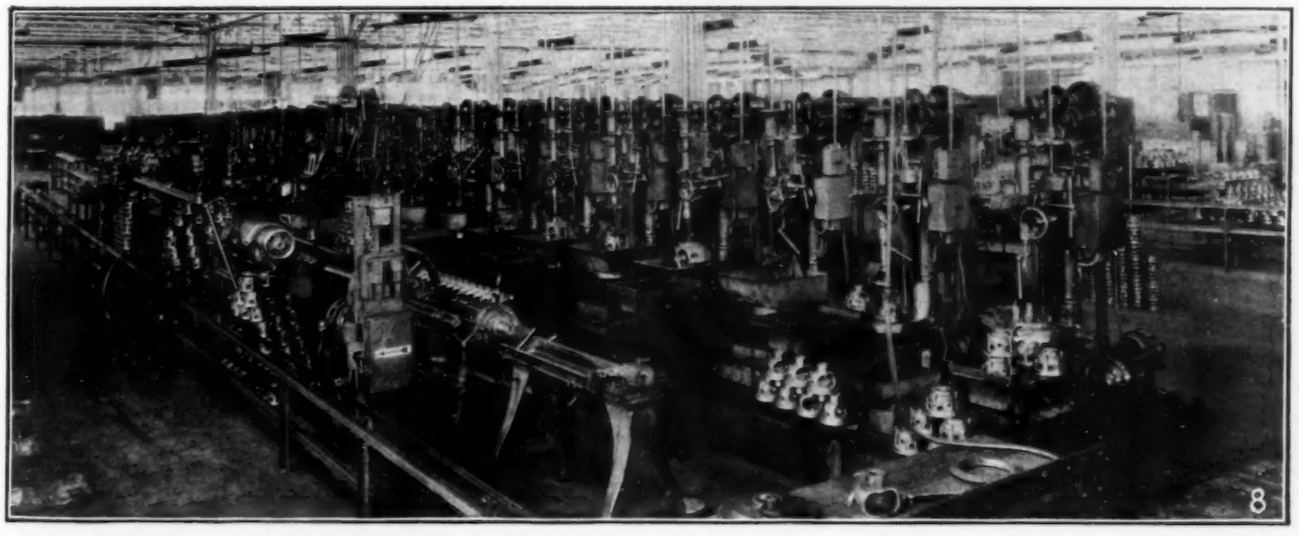
FIG. 4—CROSS-SECTION SHOWING CONSTRUCTION AND LAVATORIES

which gives an outline of the saw-tooth construction, shows how it is broken in places by the mezzanine lavatories, and how the lavatories are reached by stairs from the main shop. The lavatory floor does not project down into the shop, but it is level with the bottom of the valleys of the saw-tooth roof.

The construction gives a much more open appearance to the shop and aids in the uniform distribution of light. It also permits the complete and unhampered utilization of the space, so that departments can grow freely in almost any direction without being hampered in any way by the shop construction.

The Gould & Eberhardt machines for roughing out gears and pinions, including the complete guarding of the machines and the oil reservoirs with their pipes leading to the various bearings, are shown in Fig. 5. The battery of Gleason straight-tooth gear-cutting machines is shown in Fig. 6. The spiral gear generators shown in Fig. 7, handle both the ring gears and their pinions. Some of the ring gears are shown on the platform in the foreground. The platform consists of a substantial framework of steel panels, one on each side and held together by a cross panel at each end. The supporting feet are castings which hold the platform

FIG. 5—ROUGHING OUT BEVEL GEARS. FIG. 6—CUTTING STRAIGHT-TOOTH BEVEL GEARS



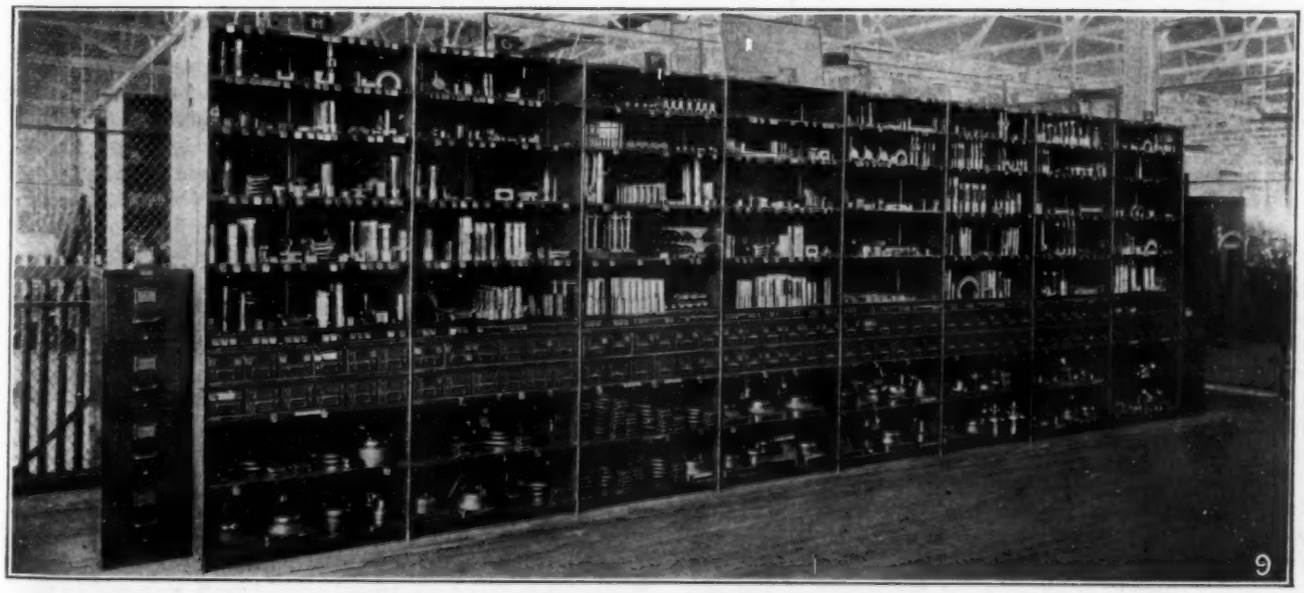


FIG. 7—WHERE SPIRAL BEVEL GEARS ARE MADE. FIG. 8—LINE-UP OF TOOLS IN MAKING DIFFERENTIAL PARTS. FIG. 9—WHERE THE INSPECTION GAGES ARE KEPT

at a proper height so as to be readily handled by the electric lift-truck.

The line-up of the department for making differential carriers or supports is shown in Fig. 8. The equipment consists largely of drilling machines, though some broaching machines and small vertical turret lathes are included.

Where the Inspection Gages Are Kept

Needless to say, the kind of work produced in this shop requires very close inspection and, in addition to an inspection room where work is checked as it progresses, inspection benches are provided in each department. The value of the necessary gages runs into thousands of dollars, for which reason the gages are kept in steel cabinets in the special inspection gage room shown in Fig. 9. The gages are all checked at frequent intervals, the routine requiring that they be

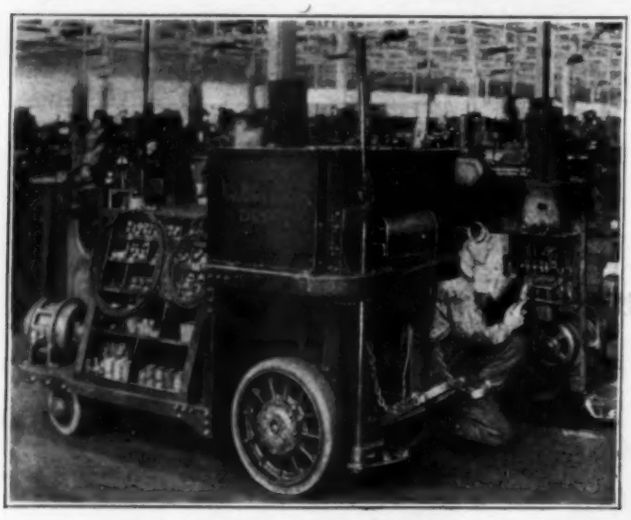


FIG. 10— THE ELECTRICAL REPAIR TRUCK

turned into the inspection gage room on certain dates. They are carefully tested either by measurement or by master gages before being again issued to the shop inspectors.

A valuable institution is the repair truck of the electrical department shown in Fig. 10. This truck carries all sorts of spare parts which are generally required in keeping motors in operation. The shelves and bins shown carry fuses of various kinds and capacities, insulated wire for emergency connection, conduit couplings and even a spare motor, in addition to the substantial vise and work bench over the bin.

Traveling Repair Shop

As soon as electrical trouble develops in any part of the shop, the electrician is notified by shop telephone and immediately runs his traveling repair shop to the disabled motor. In this way loss of time from electrical breakdowns is reduced to a minimum. This truck has been found to pay for itself many times and to aid greatly in keeping production at a maximum when trouble has developed.

There is also a very complete department for heat treating the gears, including oil and water pumps for circulating the cooling mediums, storage tank and oil for fuel. It is a thoroughly modern equipment in every particular, just as is that in the remainder of the shop which has just been described.

Cost Versus Value of Patterns

By James H. Yates

To the machine shop manager who handles much repair work the cost of patterns is always a serious consideration. Hardly one customer in ten can be made to understand why a pattern should be necessary or where the price comes in, and will always almost invariably "kick" at the item when it is time to settle the bill. In consequence, most managers look upon a pattern as a "necessary evil," to be avoided whenever possible; and because of this view of the matter I think a few comments from a practical standpoint will be of help and value to shops of this character doing pattern work.

It is common practice to obtain castings from the old part to be replaced, but this practice is, on the average, a very questionable one for several very practical reasons. In the first place, the casting is in most cases but a crude example of what is required, as it has shrunk in cooling 1/10 in. for every foot, while if it is a machined part it will have to be "doctored up" in the pattern shop to allow sufficient stock to finish it to the size desired.

Expensive Doctoring

To mold from an old or doctored casting usually consumes twice the time in the foundry that would be required if a suitable pattern were available, and the resultant casting will probably be difficult to handle in the machine shop as compared with the clean, correctly shaped casting to be obtained from a well-made wood pattern.

Then, too, the cost of doctoring the old casting, especially if it is broken, to put it in condition for molding may easily exceed the cost of a new pattern. In many cases that have come under the writer's observation the value of the time spent in "saving the cost of a pattern" has amounted to more than the saving. What is more, much additional trouble is sure to be met and time lost in the machining.

Patterns should be looked upon by shop managers as an investment instead of an expense. The investment may not be "gilt-edged," but on the average it is a very good one. The pattern is there, as good as ever, after the molder has finished with it, and if the part ever comes back for a repeat order, it may prove to be a profitable investment indeed. If a pattern is on hand, the cost of making the part a second time will be small, so that on jobs which are apt to come back again patterns should almost invariably be made of the parts to be replaced.

Erratum Notice

In the article "Making Chasers for Self-Opening Dies," on page 174, of *American Machinist*, in referring to the operation of grinding the throat of the chaser our correspondent stated that "the essential parts of the machine shown in Fig. 14 were designed and constructed at the factory where it is in use."

This statement implies that the machine itself was at least partially constructed by the users. The fact is that the machine was made, as may be seen from the nameplate on the base, by the National Machinery Co., Tiffin, Ohio. The statement should have referred to the attachment for holding the chasers.

Methods of Machine Tool Design

First Section of Chapter on Machine Tool Clutches — Jaw Clutches and Considerations Affecting Their Design—Saw Tooth Clutches

BY A. L. DE LEEUW
Consulting Editor, *American Machinist*

CLUTCHES are used in machine tool design for a great variety of purposes: for starting and stopping either the entire machine or certain functions of it, for reversing, for slowing down or speeding up certain functions, and for making shifts between speed variators.

Clutches are of two principal types: friction clutches and positive clutches. Such clutches as pneumatic or magnetic clutches are generally friction clutches which are operated by compressed air or magnetic attraction and could be arranged as positive clutches if it were desirable.

Friction clutches are necessary where a heavy load must be picked up at a relatively high speed. Positive clutches are needed where we cannot permit of any uncertainty as to the taking up of the load. For instance, we would not admit a friction clutch in a feed mechanism used for the cutting of screw threads for the possible slippage might produce variable lead in the screw.

On the other hand, we could not use a positive clutch for connecting a large belt pulley driven by a heavy belt to the mechanism of a machine. If, for some reason or other, it is absolutely necessary to use a positive clutch for starting under heavy load, we should introduce some additional mechanism which reduces the speed to safe proportions. If, on the other hand, it is absolutely necessary to use a friction clutch in a mechanism which must maintain a certain fixed speed ratio to other parts of the drive, then we should arrange it so that the possible variations in speed cannot have any effect on the ultimate result.

We will not describe here the various kinds of positive clutches, as full description and data may be found in many standard works on the design of machine elements, but we will call attention here to such features as make them more or less adapted for use in machine tool design.

Shape of Clutch Teeth

All jaw clutches used on relatively fast running shafts should be made with some angle to the teeth. Square tooth clutches can only be used where the shaft runs at very low speed, such, for instance, as the feed screws for small milling machines. Of course they can be used even on heavier machines for such purposes as the throwing in of a hand wheel or crank for temporary use by hand. The angle recommended for the teeth of such clutches is 4 deg. on a side. A greater angle would be preferable, but experience has shown that 5 deg. or more is liable to lead to a working loose of the clutch under strain.

As a rule, there is no reason why the width of the tooth of such a clutch should be equal to the width of the gap. Exceptions are such cases where a shaft runs at very low speed, and where we do not wish to wait any length of time before it is possible to throw the clutch in. If, for instance, we had a clutch on a feed shaft revolving 1 r.p.m., and if there were three teeth in this clutch, we might have to wait almost 20 seconds before we could throw it in. To shorten this time it may be desirable to make the clutch with as many teeth as the strength of the individual teeth will allow.

In Fig. 119 two clutch members are shown with beveled teeth at the moment when the sliding member is about to enter the rotating member. If we wish the teeth of the sliding member to reach the bottom of the gap of the rotary member before it takes up the load, it will have to travel a distance B during the time that the rotary member has traveled a distance A; that is, if no other clearance is provided except that due to the angularity of the teeth. This distance B is about seven-and-a-half times as much as the distance A, if the teeth have an angle of 4 deg. on a side.

Speed of Engagement

The speed with which the sliding member travels in the direction of the arrow is limited because, as a rule, it derives its movement from a lever operated by hand. Consequently, it is not possible to get to the bottom of the teeth unless the rotating member travels at a low rate of speed. If the rotative speed of P is too great or the sliding speed of Q not great enough, the side walls of the clutch P will touch before Q has reached the bottom of the teeth of P. When that happens, Q will have to transmit the entire load, and it will only be possible to move Q further if the load is light and a sufficient leverage has been provided to move Q. On the other hand, we must not forget that if much leverage has been provided for the movement of Q its sliding speed must necessarily be low.

Altogether then, we see that it is difficult to pick up a load and have the clutches in the proper relative position at the moment of pick-up unless a sufficient amount of lateral clearance is provided. It might be thought that we will get some assistance if we make the distance B small, that is, if we make the clutch teeth shallow, but this is not the case, because if B becomes less, $2A$ also becomes less and we have not improved the conditions.

In Fig. 120 we see how it is possible to facilitate the throwing in of a clutch by making the gap wider than the teeth. The excess of width is supposed to be W. The teeth are shown square in the illustration. If we had made them angular, as in Fig. 119, we would have a total lateral clearance of $W + 2A$.

Rounding of Clutch Teeth Corners

In Fig. 121 is shown what happens to the teeth due to the fact that they are apt to strike on the corners. This effect of rounding the teeth becomes worse when once a round has been produced. In the condition as shown here, the sliding member will be pushed back by the rotating member unless the load is so light that it is possible to force it into position against the load. Doing this, we must not only pick up the load, but must

For the author's forthcoming book; all rights reserved.

actually cause the sliding member to rotate at a higher angular speed than that of member *P*. As the illustration shows the conditions, there is no clearance at all and it would be practically impossible to make these clutches mesh if load or speed are appreciable. Giving the teeth a slight angle will assist conditions somewhat, but even then *Q* will be pushed back by the roundness of the teeth and this will be repeated over and over again, causing the round to become much more pronounced.

With good conditions, we will find that the round on clutch teeth gradually obtains a radius of about $\frac{1}{4}$ in. Fig. 122 shows what is the effect of this round when the teeth are in mesh. There is only a distance *E* left where the teeth properly bear one against the other.

FIG. 119

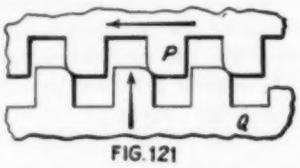


FIG. 121

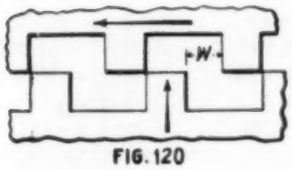


FIG. 120

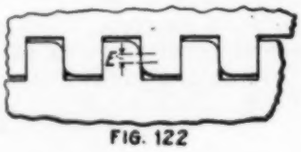


FIG. 122

FIGS. 119 to 122—FORMS OF JAW CLUTCH TEETH

If the round of the teeth becomes $\frac{1}{4}$ in., then $\frac{1}{4}$ in. of the length of the teeth is lost. In other words, if the clutch teeth were less than $\frac{1}{4}$ in. in depth there would always be a tendency to throw the sliding member out of mesh and the clutch would cease to act. In order to have sufficient bearing surface, the teeth should be more than $\frac{1}{4}$ in. in depth.

It has been found by experience that the circumferential speed of a jaw clutch should not be more than 150 ft. per minute. Should there be a case where it is almost unavoidable to use a higher speed, the depth of the clutch teeth should be somewhat increased. If, for instance, a depth of tooth of $\frac{3}{4}$ in. satisfactory with a speed of 150 ft. and it should be necessary to use a clutch for the same load but running at a speed of 200 ft., it would be advisable to make the depth of the teeth $\frac{1}{2}$ inch.

The shock on the clutch teeth is almost entirely due to the load; that is, to the number of foot-pounds of work per minute. So long as this load is the same, it makes relatively little difference so far as shock is concerned at what speed the clutch is running. If, for instance, 75,000 ft. lb. per minute must be transmitted and a clutch is used running at 150 ft. per minute, we will have a pressure on the teeth of 500 lb. If the clutch were running at 200 ft. the pressure would be 375 lb.; but the shock has not been diminished because the amount of work done is the same.

It was said that the shock is *almost* the same. It is not entirely so, because the energy of the revolving clutch has been increased on account of its greater speed. However, as a rule, this is but a small percentage of the total load to be picked up.

When the clutch, in the previous example, is made to run at 200 ft. per minute, but retaining the pressure of 500 lb. on the teeth, the amount of shock is materially increased because the work has been increased from 75,000 to 100,000 ft.-lb. We see, then, that the limit of the circumferential speed of the clutch is not set by the fact that the load increases with increased speed, but to something else and that is, that it becomes increasingly difficult to make the clutch mesh when we increase the speed.

Saw tooth clutches provide naturally the necessary clearance for throwing in, and are therefore less liable to be rounded off or to rebound. As a result, it is possible to make saw tooth clutches of less depth than square tooth clutches. Great caution should be exercised when designing saw tooth clutches for heavy loads for, while there is sufficient clearance, it is still possible that the point of the tooth will have to bear the entire load, so that it is liable to be broken off when made of cast iron or hardened steel, or bent over if made of soft steel. The form we should have to give the back of a saw tooth clutch in order to make it of equal resistance at all points would be the parabola. As this would lead to difficulties in manufacture, it is advisable to approximate this form by giving the tooth a land at the top and making the angle of the back such that the actual shape of the tooth will fall outside the theoretical parabola. This is indicated in Fig. 123 where both the theoretical parabola and the practical straight line outline are shown. As will be seen, the strength of the tooth is somewhat greater than if the parabola had been used.

If we imagine one of these clutches being cut on a milling machine, and if Fig. 124 represents an end view of part of such a clutch, we would find that the lines *AB* and *CD* are parallel because *AC* or *BD* is merely the width of the cutter at its outside diameter. The lines *EF* and *GH* might be parallel or they might be as shown by the dotted line *EF*.' Fig. 125A shows

FIG. 123

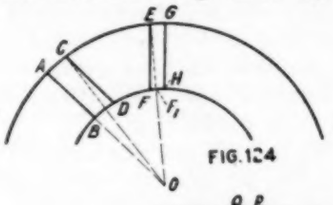


FIG. 124

FIG. 125 A

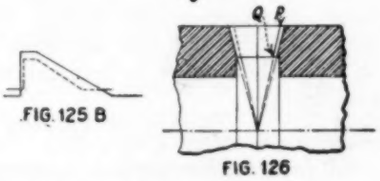


FIG. 126

FIG. 125 B

FIGS. 123 to 126—DETAILS OF SAW TEETH

the end view of a tooth both at the outside and the inside diameter; the full line showing the form at the outside and the dotted line the form which the tooth would have at the inside if all the lines *AB*, *CD*, *EF* and *GH*, Fig. 124, had been radial. As these lines are not radial, but are as shown in Fig. 124, the result is that the inside shape of the tooth will be as represented by the compound line in Fig. 125A.

We are never absolutely sure that the load will be picked up by the entire surface *GH* (see Fig. 124). Due to some looseness or imperfection here or there it is more likely that the first shock of the load will be borne either by the point *G* or the point *H*. The proportions of the tooth are correct at the point *G*, but at the point *H* these proportions are what the machining operation made them and not the result of design and calculation. Fig. 125A shows very clearly that even with the proper

way of manufacturing we would obtain a tooth at the inside much less strong than at the outside and the fact that we did not manufacture by the proper method has still further reduced that strength.

In order to obtain a tooth of equal strength at all points, we should have manufactured by a method similar to the cutting of a bevel gear. The result is shown in Fig. 126. All cuts are taken toward the center, so that the inside of the clutch will have a smaller height as well as a smaller length of tooth. Doing this, the end view of the tooth would become as shown in Fig. 125B, and not as in Fig. 125A. Not enough attention is paid to saw tooth clutches, their design and manufacture, and this is probably the reason why one finds them very seldom in heavy machine tools, though they are used in light machinery where the load is never heavy enough to cause breakage.

Wherever possible, saw tooth clutches should be used in preference to the square tooth variety. However, they are not adapted for reverse movements. Neither can they be used when it is essential that there shall be no lost motion between the teeth of engaging members.

In the foregoing the saw tooth clutch was shown with one vertical face. Though the angle of the active face is no longer necessary for the throwing in of the clutch, yet it is desirable to give the saw tooth clutch also an angle of about 4 deg. It will be found with square as well as with saw tooth clutches that at times it is difficult to disengage the clutch on account of the friction set up by the heavy pressure, and which may be considerable as the clutch teeth are not lubricated. Slight roughnesses in the teeth may make the disengagement exceedingly difficult. The angle of 4 deg. will materially assist in throwing out.

When saw tooth clutches are made without a land at the top and without flat at the bottom, they can readily be made on the milling machine by using an angular cutter of the proper shape and setting the clutch at an angle. The result will be as shown in section in Fig. 126 and it will be found that it is not necessary to bevel the top of the clutch along the line *PQ*. The blank may be turned up with a flat face and the result of the milling of the teeth will be that all the tops of the teeth lie in a cone.

Another Machinist Has Reminiscences

By Stephen McEvoy

After many years in the machine shop, during which time I have taken a turn at about every branch of the business, I often sit back and laugh as I recall some of my experiences, although many of them at the time they transpired seemed to be anything but humorous. These recollections help me to realize how little any one man actually knows. As a case in point I will relate one such experience that befell me years ago and taught me that it is not always safe to judge by appearances.

I was at the time foreman of a machine shop where, I am sorry to say, I had the reputation of being an "A No. 1 hard-boiled egg" who thought he knew all and then some about the machine business. I had gathered about me as strange and motley a crew of journeymen and apprentices as any old-time writer of fiction might desire, and among the apprentices was one mild youth of polished appearance and manner who was destined to teach me a lesson.

One of the jobs that occasionally came to us was the cutting of some large screws, quadruple thread, of 0.888-in. lead. Though this job was continually recurring, there was never at any one time a sufficient quantity to warrant the making of a master faceplate or any of the modern devices for securing accuracy and speed of production on such jobs. My method was to shift a change gear one-quarter turn for each separate start as I had been taught to do and which, I thought, was about the only method worth considering.

This method if carefully carried out will produce satisfactory results, as every mechanic knows; but, because of backlash, miscounting a tooth or so now and then, and general carelessness or cussedness on the part of the workmen, it was rare that I got a screw that could be induced to go in the nut without a great deal of filing and fitting. This state of affairs caused me great concern, besides eliciting much lurid language both from me and from my immediate superiors. It also helped to swell the scrap pile.

On the occasion to which I am referring an order had come through for one such screw and nut, and as usual, the screw when cut would not go into the nut. Here, thought I, is where I take it out of my polished apprentice; and to him I gave over the job of fitting, explaining to him in careful, though forceful English just what was to be done and how he was to do it. He listened attentively without giving me a chance to "go off the handle," and I finished by setting a time limit on the job which I knew to be impossible of accomplishment.

Just then I was called into the office where I was detained for a considerable time, listening to the choicest kind of a bawling out that ever fell to the lot of a harassed foreman; all on account of the cost and general inaccuracy of those same pesky screws. When I returned to the shop my temper was at the boiling point and I was in fit condition to annihilate that quiet little apprentice if things had not turned out satisfactorily.

Although the ridiculous time limit that I had set had not expired, I found my little man unconcernedly running the nut back and forth over the screw—a finished job and a perfect one, though a file had never been near it. I took it from him and held it in speechless amazement, mingled not a little with shame, as I listened to his explanation of how he did it.

That was a long time ago. You all know now, and I presume that many of you did then, how easy it is to set the compound rest parallel with the shears of the lathe and take one cut, draw the compound slide back one-quarter of the lead to take the next cut, and so on until you have finished.

That is what he had done. The lathe he had chosen was one of the few then in existence that were fitted with micrometer dials on cross and compound screws. When I had gotten the sand out of my eyes and put some prussian blue on the threads, I found that he had a perfect bearing on all of them.

I had learned my lesson. I never assume that a man knows less than I do because he *looks* that way. My apprentice got a raise that enabled him to look more polished than ever. He also got the job of making all such screws that came to the shop thereafter. Our superintendent got good screws at less than half the previous cost. The only sufferer was the scrap pile.

Heavy Machine Work in a Railroad Shop

Some Operations on Locomotive Side Frames—Method of Machining Cylinders and Valves —Work on Crankshaft for a Steam Boat

SPECIAL CORRESPONDENCE

THE first illustrations in this article relate to certain operations on locomotive side frames, Fig. 1 showing a very convenient laying-out floor with a big iron bench and rigid horses on which heavy frame sections, as well as lighter work such as rod straps, can be placed for laying out with square, surface gage, scales and calipers. Two large frame sections can be seen in the foreground with a number of straps and other parts on the big bench plate at the rear. The parts to be laid off for finishing are measured over important points, chalked on the surfaces and scribed and center-punched for center lines, hole centers and other working locations. Also, finished work is here readily inspected for squareness of surfaces, uniformity of corresponding dimensions, and general accuracy of all measurements, as called for on the blueprints.

A great deal of the work necessary in machining locomotive frames is naturally handled on the vertical slotting machine, and Fig. 2 illustrates a slotter machining along the edges of heavy frames. The slotting-tool holder shown is made with back-stroke relief, so that upon the return stroke of the slotter ram the cutting tool is relieved in the cut, and upon the down stroke it again takes its original cutting position. This relief is obtained by means of a pivoted holder for the cutting tool, which holder is so operated by a compression spring as to normally stay in the working position, but upon the up stroke to swing back against the spring sufficiently to relieve the pressure of the tool point upon the work surface. Another interesting feature of this slotter tool is the swiveling and adjustment at the neck, by which the toolholder is connected to the shank proper, and by means of which the tool may be set around at any desired angle so that it can work along different surfaces and in corners to advantage. The rigidity of the construction permits the taking of deep

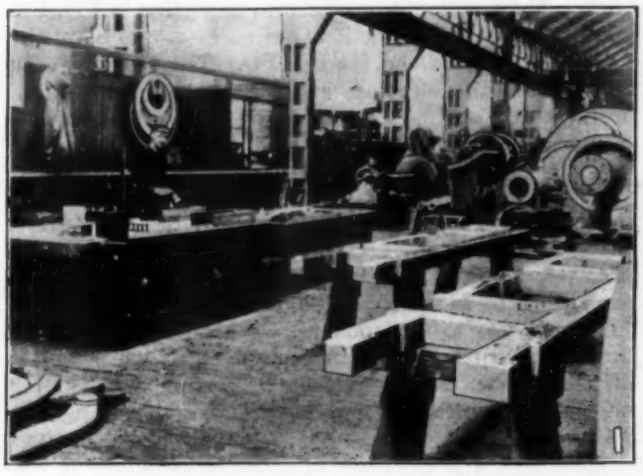


FIG. 1. EQUIPMENT FOR LAYING OUT WORK.

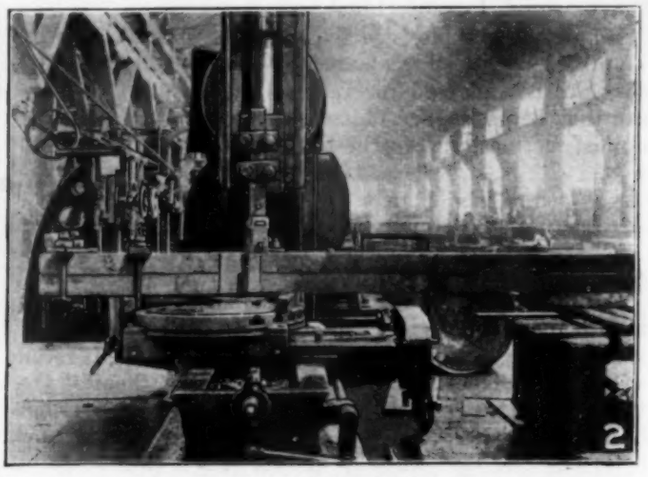


FIG. 2. A PAIR OF FRAMES ON THE SLOTTER

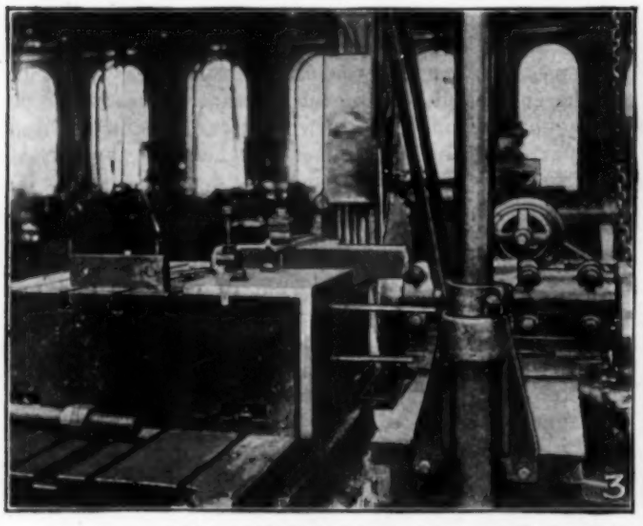


FIG. 3. SAWING OFF END OF FRAME SECTION.

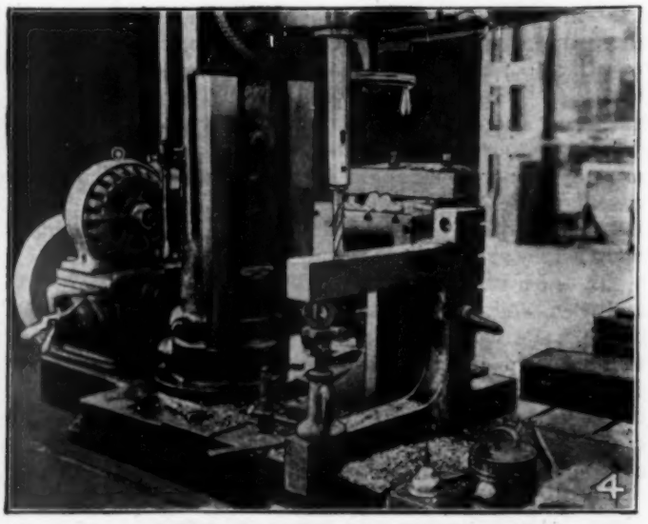
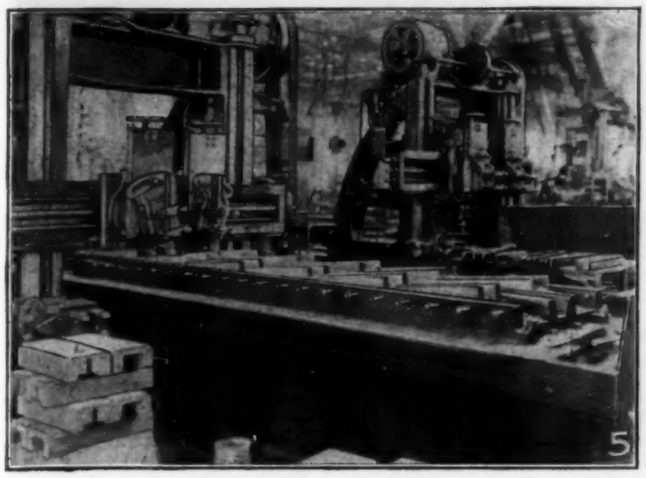


FIG. 4. DRILLING A FRAME MEMBER



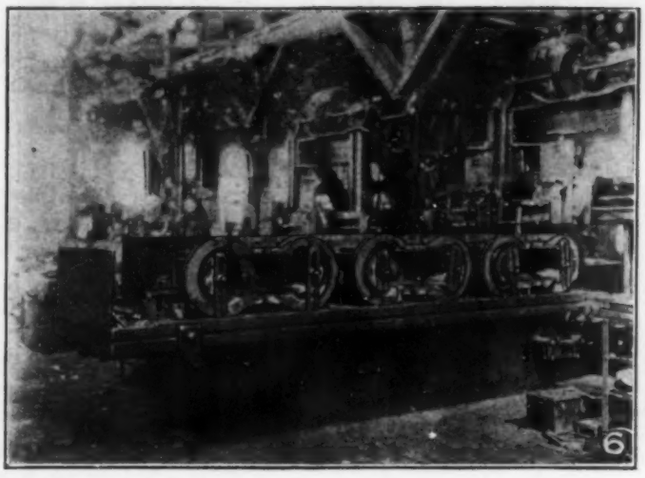


FIG. 5. PLANING WEDGES. FIG. 6. PLANER FIXTURE FOR DRIVING BOXES

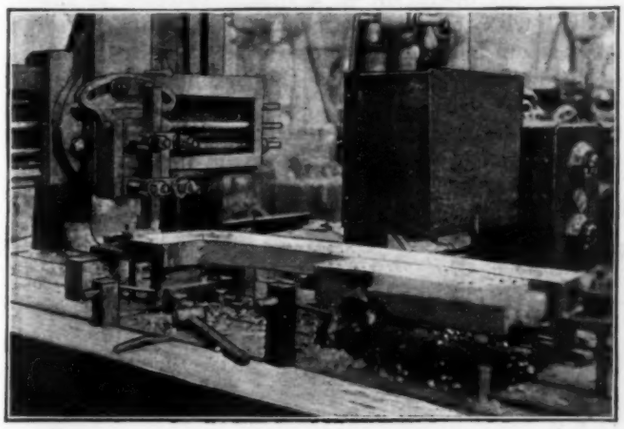


FIG. 7. PLANING A GUIDE YOKE

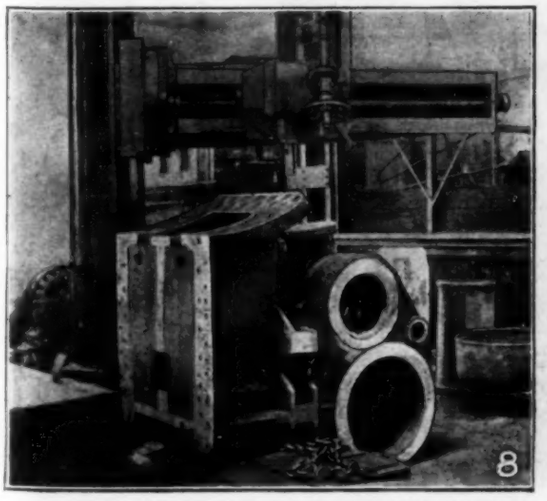
heavy cuts, and a pair of frames may be slotted at one setting all the way around. The frames rest upon parallel strips on the slotter table, and the outer ends are carried on rollers placed on parallel bars on a stiff floor support, which also can be rolled to give free movement for the adjustments.

In Fig. 3 a frame section is illustrated as forged up in the blacksmith shop and ready for the cutting off of the end with the cold sawing machine. The frame section is rigidly strapped to the upright face of the work table and the end projects sufficiently to allow the saw to clear the angle back-support on the table. This saw is used in various ways for work similar to that illustrated. One interesting application is to the cutting out of such work as rod ends to reduce the labor of drilling or otherwise getting the metal out of the open end of the rod. With the saw the bottom clearance holes are drilled at the inside of the rod end to allow the saw to run out at the end of the cut; and if a pair of saws are combined, the two sides of the rod end opening are cut out at once.

A drilling operation on the frame section is shown in Fig. 4, with the work under the radial drill. The work is clamped to the side of a big angle plate and a jack is applied to take the downward thrust of the drill.

Some planing jobs are shown in the illustrations which follow. The fixture on the planer in Fig. 5 is a double one, for holding two rows of wedges, there being twelve wedges in the fixture as set up. Along the center of this fixture there are parallel ledges, against which the work is forced by the series of setscrews tapped through the side walls of the fixture. Two eyebolts are tapped into the top of the fixture, so that it can be readily picked up by slings and hooks with the overhead crane.

A fixture for holding driving boxes while planing the shoe and wedge bearing surfaces is illustrated in Fig. 6. This fixture is also a double arrangement with central



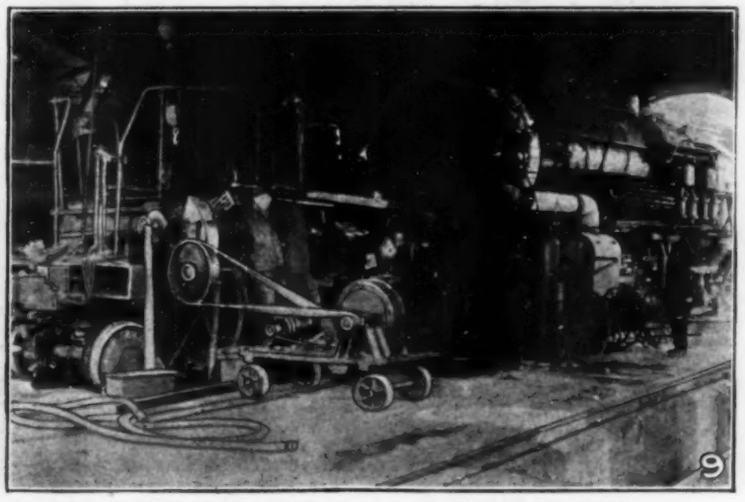


FIG. 8. CYLINDER DRILLING OPERATION. FIG. 9. REBORING A VALVE CHEST ON A LARGE ENGINE

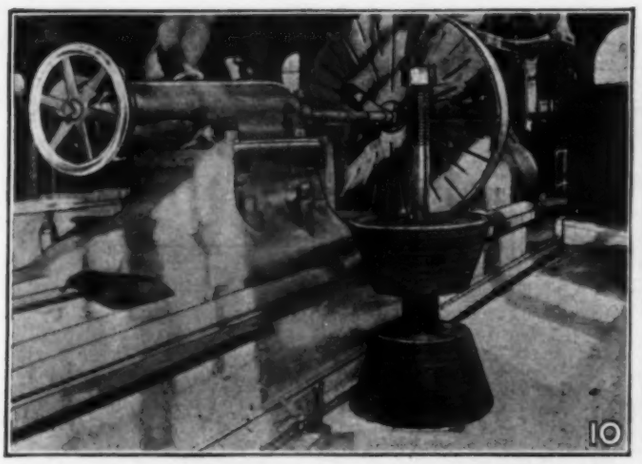


FIG. 10. LARGE MANDREL AND TURNING OPERATION ON TUMBLER SHAFT.

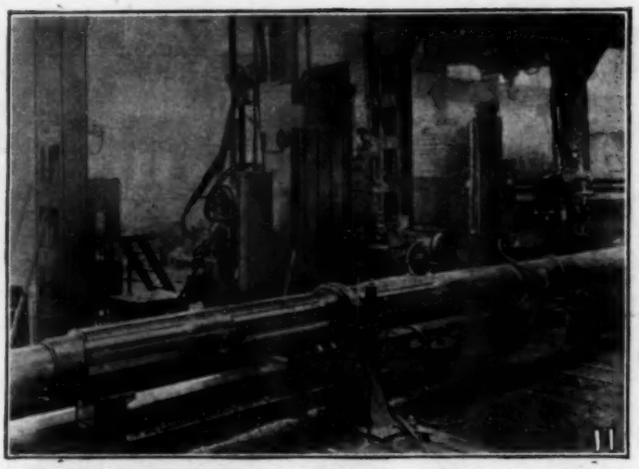


FIG. 11. MILLING KEYWAYS IN STEAMBOAT SHAFT

walls, against which the boxes on each side are securely clamped by bolts and straps as indicated. The fixture holds six boxes on each side. It will be noticed that, in addition to the straps by which the boxes are secured to the vertical ledge on the fixture, there are table straps between each pair of boxes to hold them down securely to the pløten.

The operation illustrated in Fig. 7 is the planing of a special crosshead guide yoke. This yoke was cut out of metal 2½ in. thick by means of the oxy-acetylene torch and is shown as planed on the surface on a 42-in. x 10-ft. planer. An interesting feature of the job is the method of supporting and holding the work against side thrust by the stiff table posts with the downward pointed "toes" which bear against the sides of the yoke.

Cylinder work is always of interest in the railroad shop because of the size and shape of the casting and the special means often resorted to in handling the various operations. A very large cylinder casting is shown in Fig. 8, with the work in position under the radial drill for drilling and tapping various flange stud holes. This casting with its cylindrical valve chest has been bored, and the various faces have been planed on the draw-cut shaper. Under the radial machine it is possible to drill quite a number of holes before it becomes necessary to readjust the work.

A reboring operation on a similar cylinder is shown in Fig. 9 with the portable machine set up for operating in the steam chest. The illustration shows a big Mallet locomotive with half of the engine well stripped down in the round house. The portable boring bar is driven by means of a motor which is mounted upon a low truck so that it can be hauled to any point required. The motor is belted to a jack shaft on the truck and the power for the boring outfit is taken from a small

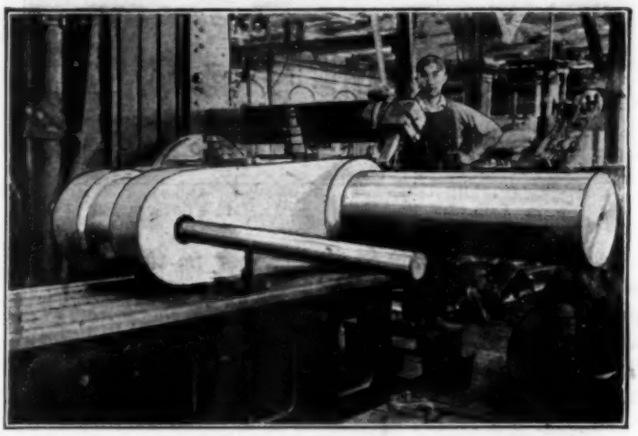
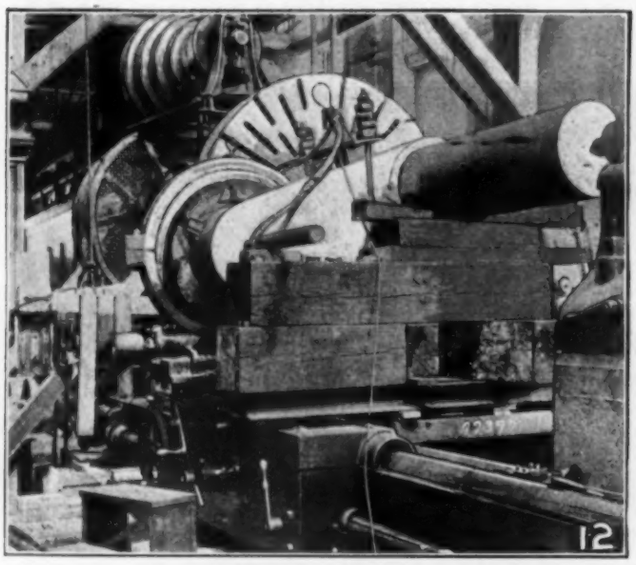


FIG. 14. SHAPING ENDS OF YOKE ON CRANKSHAFT



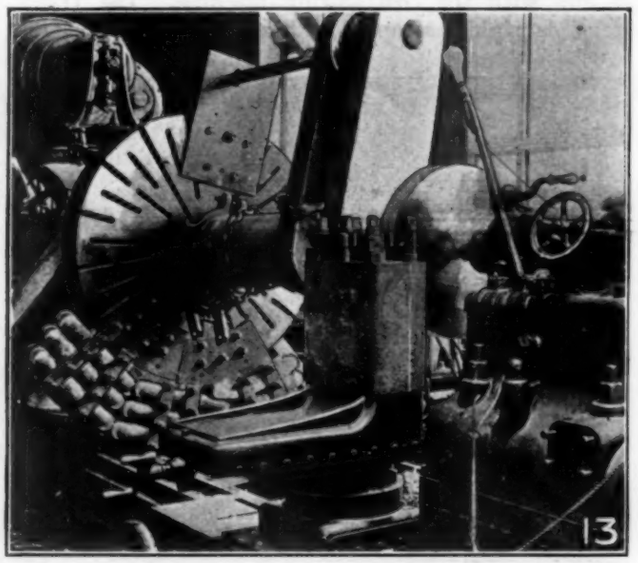


FIG. 12. TURNING PIN ON STEAMBOAT CRANK.

FIG. 13. TURNING STEAMBOAT CRANKSHAFT

pulley on the end of the shaft. Behind the boring outfit can be seen a workman repairing a yoke by welding with the acetylene torch.

In Fig. 10 at the rear of the big lathe can be seen a mandrel for turning piston valve cages or bushings for various sizes of engines. This mandrel is made up of a heavy arbor with two cast-iron drums or cones. One of these is fixed at the end of the arbor while the other is adjustable along the arbor. Steps of corresponding diameter are turned on the cones, so as to receive work of the various sizes coming through the shops. With a sleeve or bushing put in place on the proper size of shoulder on the cones, the nut is tightened up and the work held securely for turning. The operation shown under way in the lathe is the turning of a tumbling shaft which is here mounted upon centers and driven by one of the arms contacting with a driver in the faceplate.

A Steamer Shaft

These shops, the Southern Pacific at Sacramento, have had a good deal of marine work along with regular railroad equipment to care for. Consequently, some of the operations attended to are of most unusual character. Thus, Fig. 11 illustrates a steamboat shaft 15 in. in diameter by 30 ft. long in which a number of keyways are being cut. The work is done in the draw-cut machine with a milling cutter. The feed for the cut is by means of the traveling column on the bed of the machine. Several floor blocks of cast iron with V-tops are used for holding the shaft during the operation. There are four sets of keyways cut along the shaft surface for the hubs of the spiders of a pair of paddle wheels.

Another steamer job is shown in Fig. 12. This is a crankshaft, which is here represented with a special rig in operation turning the crankpin. The work is blocked up in the lathe and lined up by the centers. The device for turning the crankpin is a worm-driven ring revolving in a bearing whose base is carried upon the lathe carriage. The carrying housing for the revolving ring is, of course, made in halves, enabling the case to be opened to remove the ring, which is also made in two parts. The ring is really a hollow mill with inserted tools, made to revolve around the crankpin and turn it to size. The feed is provided by a toolholder, which is moved along its guide in the turning ring.

The drive for the wormshaft is taken from a motor shown near the head of the lathe. In operation on this crank the tool was driven at the rate of about four turns per minute, and given a feed of $\frac{1}{2}$ in. per revolution. Three roughing cuts were necessary in turning down the rough crankpin and then a finishing cut taken with a goose-neck tool. About $1\frac{1}{4}$ in. of metal was removed in sizing the pin.

The turning of the shaft bearings, web sides and disk was accomplished with the crankshaft on centers and the faceplate heavily counterbalanced, in the manner shown in Fig. 13. The headstock and the footstock are shown blocked up, as in the previous illustration, and the tool for turning is carried on an elevating block on the toolrest of the carriage.

The final illustration, Fig. 14, shows the crankshaft set up on the draw-cut machine for the shaping of the curved ends of the webs and throws. The advantages of this type of machine for such work are evident. The ram reaches well out over the edge of the outer crank and by taking the cut on the draw stroke eliminates likelihood of chatter and irregularity of surface. The simplicity of the set-up for the work is also a decided advantage, as the setting of jobs of this character often consumes more time than the actual machine performance.

P. A.

By Charles W. Lee

P. A. stands for Purchasing Agent; and pity the poor traveling man who has to "stand for" the average P. A., who, in the words of the manager of a large works where I recently called, "thinks this whole big establishment exists merely to give him a chance to buy something," and to whom Joe Renshaw's definition, "A P. A. is a man who knows that 99c. is less than $1 and that's every damn thing he does know," still applies after 50 years.

Here is something that happened recently. A price was requested and given on a repair part, and the P. A. wrote back that $75 was too much for the piece, that $60 was ample and all that he would pay; to which the reply was that if the P. A. would look more closely at the decimal point he would see that the price quoted was $7.50 and not $75.

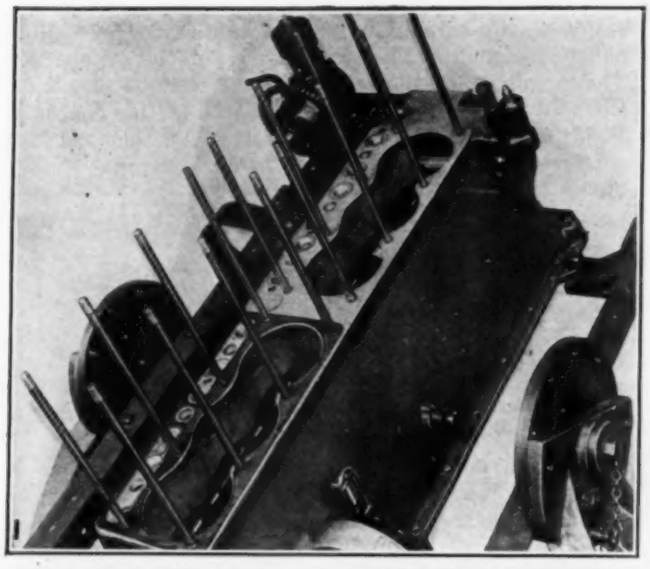
Every railroad man knows that the principal cause of hot boxes is "P. A. oil," and every shop man knows that the shop runs behind $300 while the P. A. wastes time and money telephoning all over the state trying to save 3c. on a keg of nails.

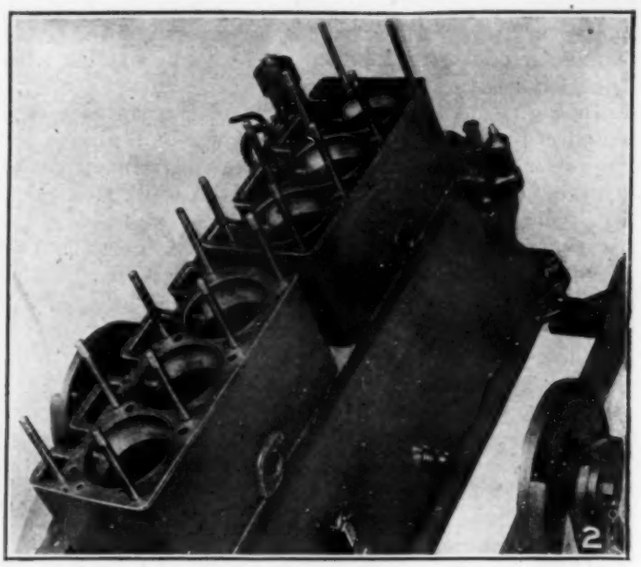
Now you know it has been mighty hot lately, and no traveling man likes to wait 40 minutes in a stuffy coop without word of any sort from the lordly P. A. You would probably do as I did, i.e., conclude that your time was fully as valuable as that of the P. A. and might better be put in elsewhere, which proved a good hunch for me, as at the next place I was received by the engineer of the works and taken in to see if I could furnish anything to do a certain thing better than it was being done.

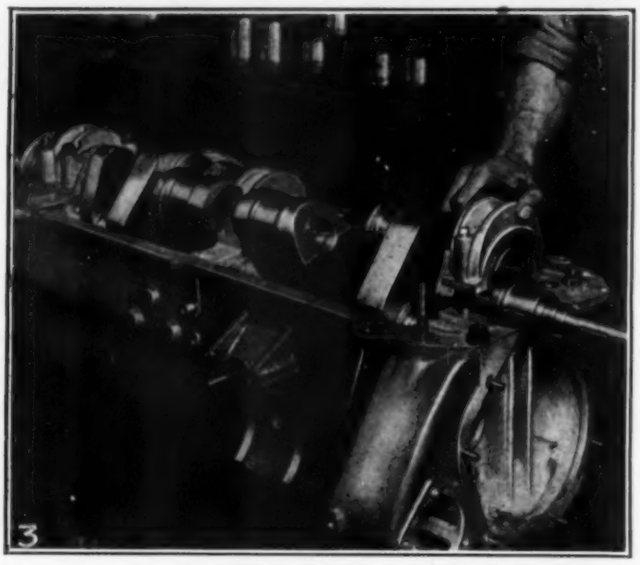
Here is what I am trying to get at: After 35 years of traveling it still amazes me that any concern that has anything to sell—which, of course, is every concern—should fail to realize that without buying there could be no selling. This is so simple a proposition that it is axiomatic and therefore cannot be proved; and it does seem to me that it would be well for every concern to treat the seller of today—who may be the buyer of tomorrow—with courtesy.

It would have been a simple and easy matter for the P. A. mentioned, who is of a type very frequently met—or failed to be met, to be more exact—if he was to be busy for 40 minutes, or as much longer as it would eventually have been if I hadn't gotten sore and flown the coop, to send out word that he would be busy for the specified time and if the traveling man had elsewhere to go, to go ahead and come back at 2 o'clock? Even the traditional message. "Nothing in your line today," would be better than *nothing*, as it would give a man the chance to put in his time elsewhere doing something more productive than waiting.

When I ran a shop "many years ago" I never failed to see every traveling man who called, and it was a mighty poor fish of a traveling man that I couldn't get valuable information from (there I go again, "never use a preposition to end a sentence with"). And the net result was all to the good. If then, why not now?







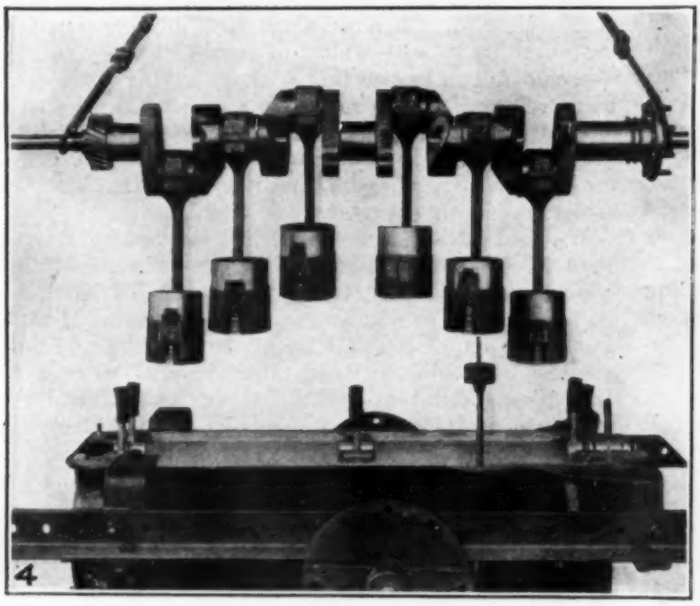
Ten Steps in Marmon Assembly

SPECIAL CORRESPONDENCE

One of the most vital items in the building of good motor cars is care in assembling. These pages show the methods of handling the motor assembly in the Marmon plant, some being equally valuable in repair work.

In Figs. 1 and 2 the crankcase is shown on the assembly stand. The stand is then swung over, the crankshaft lowered into place and the bearing caps fitted, as in Fig. 3.

The crankshaft is then removed, the rods and pistons put in the shaft and the guards put over the rings as shown in Fig. 4. The guard is hinged at the back and held by the wedge-shaped clamp shown. These guards compress the rings in their grooves and allow the piston to easily enter the cylinder bore. As the pistons go down the guards slide up on them. The guards are easily removed by lifting the wedges. The top



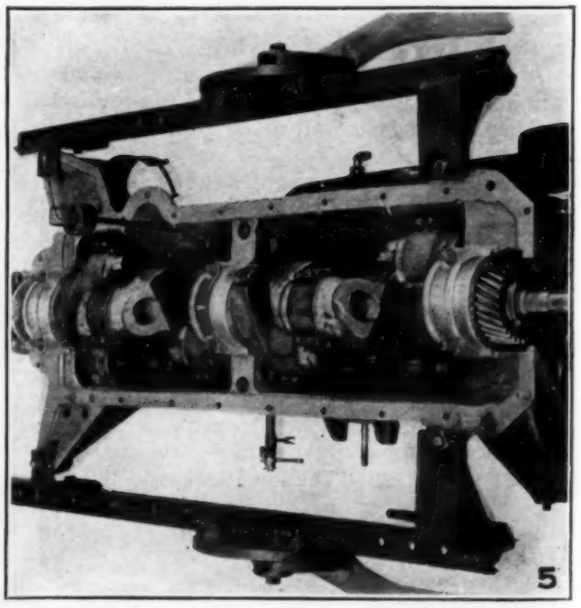
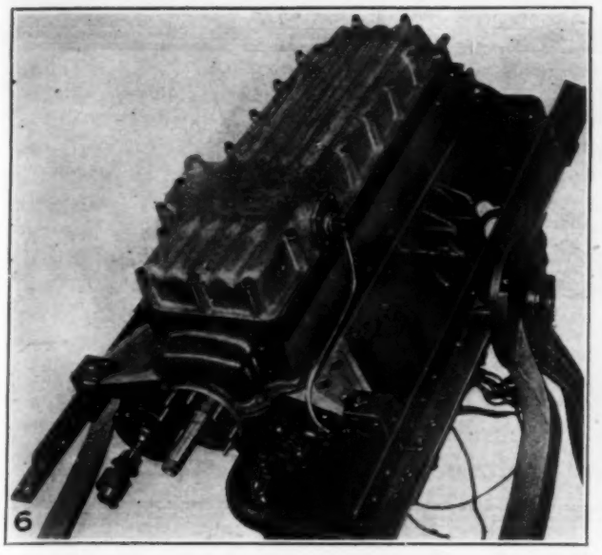
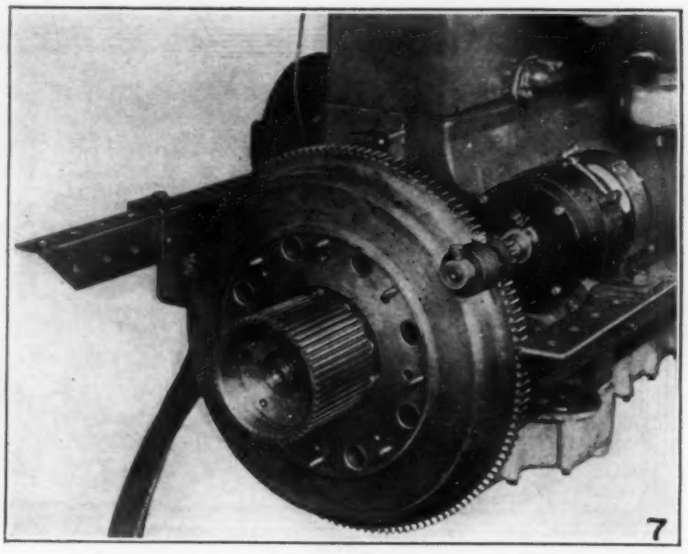


FIG. 1. ASSEMBLING STAND WITH UPPER HALF OF CRANKCASE IN POSITION. FIG. 2. CYLINDER BLOCKS IN PLACE ON CRANKCASE. FIG. 3. FITTING BEARING CAPS TO CRANKSHAFT. FIG. 4. CRANKSHAFT WITH PISTONS AND RODS ATTACHED READY TO BE LOWERED INTO PLACE. FIG. 5. TOP VIEW OF MOTOR READY FOR OIL PAN



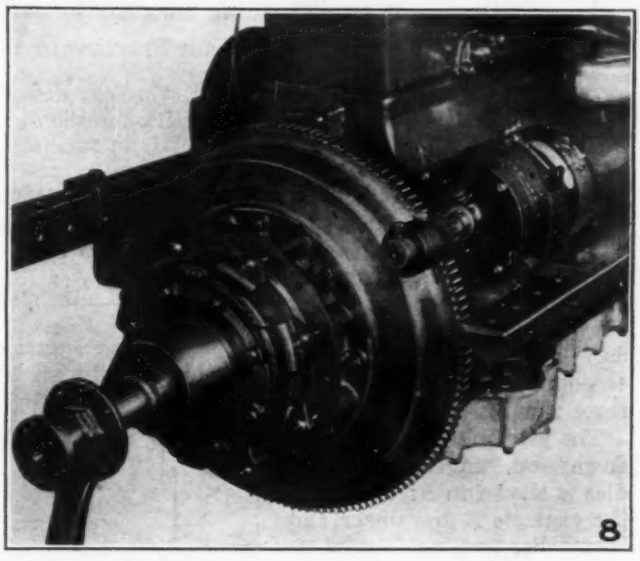


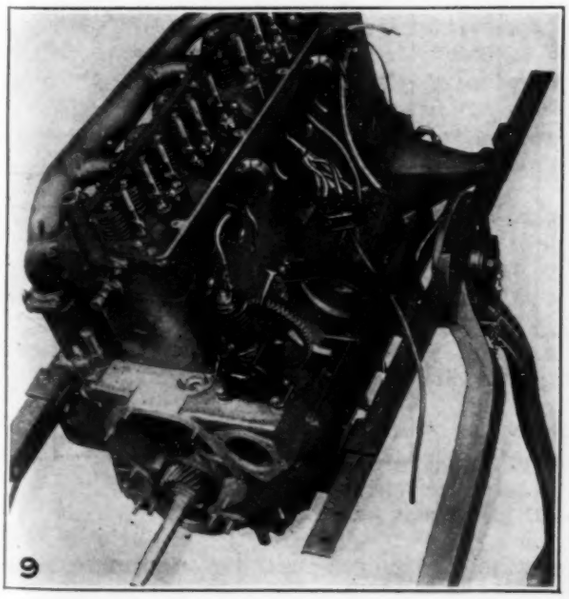
view, Fig. 5, shows the shaft in place ready for the lower half of the crankcase to be put on.

The lower crankcase in place is shown in Fig. 6. In Fig. 7, the flywheel and inner clutch members are in place. The starting motor, with its Bendix drive, is also shown as well as the simple manner of mounting the motor by means of the straps and adjusting bolt.

In Fig. 8 the outer clutch members are shown in place. It also shows the construction of the clutch. In Fig. 9 the assembly is rapidly nearing completion with the cylinder head and valves in place. The generator, held in a manner similar to the starting motor, is not yet in place. The timing gear, which incidently is of duralumin, to reduce noise, is also missing.

A very complete test stand is shown in Fig. 10, as well as the large intake and exhaust manifolds and the carburetor. The large generator furnishes the load while the tachometer, geared direct from the generator shaft, indicates the speed of the motor in revolutions per minute, which must be known throughout the tests.





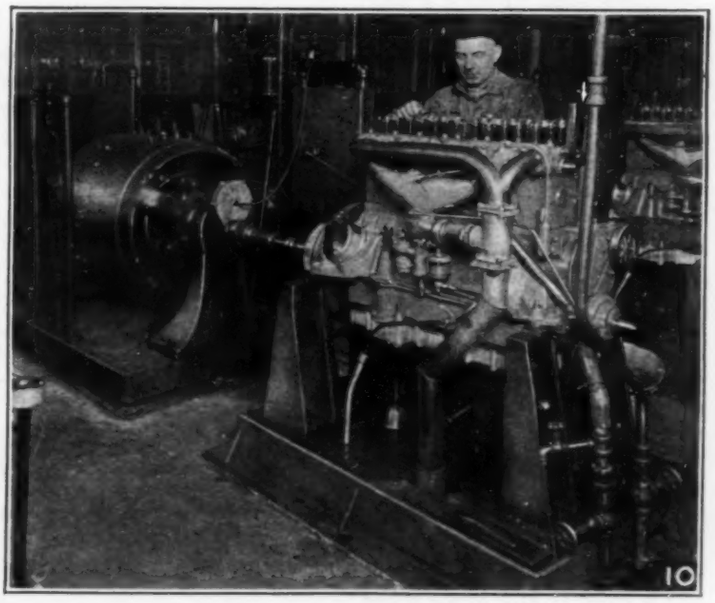
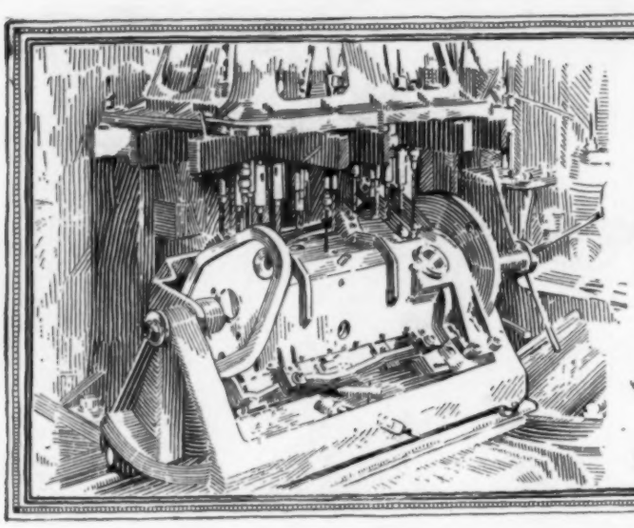


FIG. 6. CORRUGATED OIL PAN IN PLACE WITH OIL PIPE CONNECTIONS. FIG. 7. FLYWHEEL, CLUTCH SPIDER AND STARTER IN POSITION. FIG. 8. CLUTCH ASSEMBLY COMPLETE AND TRANSMISSION SHAFT. FIG. 9. CYLINDER HEAD VALVES, TURNING GEAR AND TIRE PUMP IN PLACE. FIG. 10. FINAL TEST STAND WITH DYNAMOMETER AND TACHOMETER



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Design of Drop-Forging Dies Continued—Use of Edgers and Fullers—European and American Practice in Forging Non-Ferrous Metals

PIECES or work shapes are bent, "broken down" or "edged" in order to make less work for the dies in the actual striking up of the metals in forgings. Proper attention is not given to edges in many cases, because of the desire to keep the die-blocks as small as possible on account of economy. When die-blocks are too small there is very little room for the edger, and the consequence is that the upper and lower impressions are required to do more work than they should do. Therefore, they are not economical and wear out much more rapidly.

The principle of the "breakdown" or "edger" used for dies is shown in Fig. 431. In the example *A* the upper and lower dies are cut out at *B* along one edge in such a way that the stock can be placed here when in the rough and then roughly shaped into the required form. By doing this, much unnecessary work is avoided and the piece can be transferred from the edger to the impression and rapidly brought into shape. The importance of allowing sufficient stock in the die is clearly shown by this illustration, for there must be a sufficient distance between the edger and the impression, as shown at *C*. Otherwise the die will not stand up well and inaccurate work will result.

Several important points are shown, to illustrate the appearance of a die when looking down upon it and to give the names of the various parts of the die. The flash and gutter are shown, respectively, at *D* and *E* and the impression at *F*. The sprue *G* may be considered as the "neck" at the end of the impression. The gate *H* is the portion which approximates the size of the bar from which the forging is being made. The sprue should be comparatively thin so that it can be easily broken off.

An instance of a die having upper and lower impressions *K* and *L* and a very irregular lock is also shown in this illustration. The lock is made as indicated merely on account of the peculiar shape of the forging.

In order to save stock in the dies and to economize on the labor necessary, there are certain cases when an edger may be made from a separate piece. It is

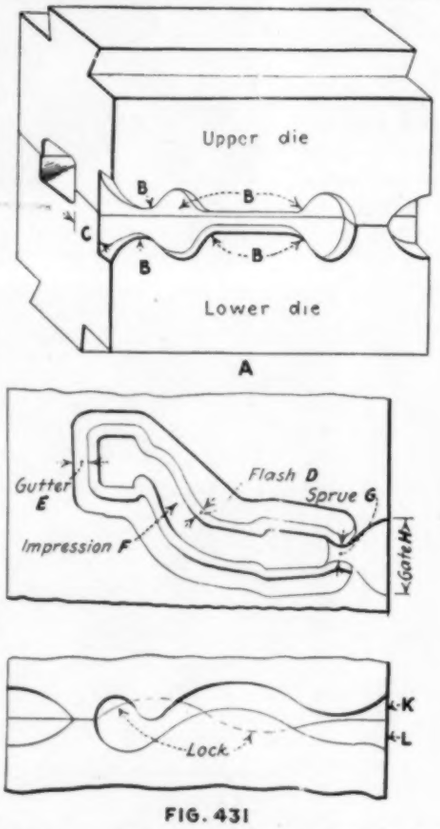


FIG. 431

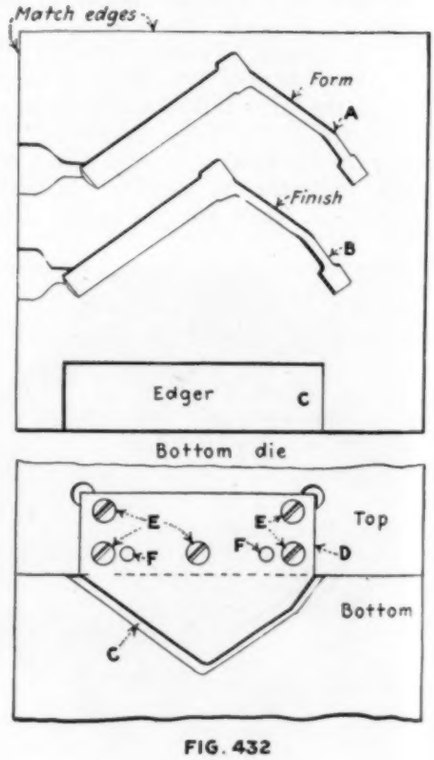


FIG. 432

FIG. 431—BREAKDOWN OR EDGER USED ON FORGING DIES. FIG. 432—EDGER MADE OF SEPARATE PIECE

For the authors' forthcoming book. All rights reserved.

not considered the best practice, however, to do this, although it may be found an advantage in some cases. Fig. 432 shows an example of this kind in which the die has both form and finish impressions at *A* and *B*. The edger *C* is cut out in the lower die, and the upper one contains a separate piece *D* which is carefully located and fastened in place by means of screws and dowels at *E* and *F*. If the edger was to be made in one piece, all the rest of the die would have to be cut away, which would be an expensive machining operation.

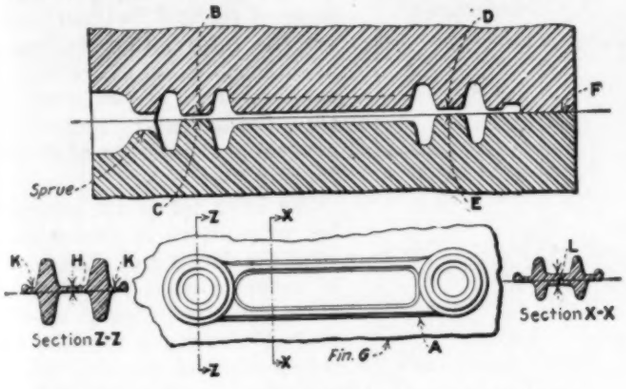


FIG. 433—METHOD OF MAKING HOLE IN FORGING

Hence, it appeared desirable to make up a separate piece as shown here.

There are many forgings of levers, connecting rods and similar work which require holes to be located in them. The holes cannot be made completely through a hub or boss, but the greater part of the metal can be removed so that only a thin web is left, which can be removed by punching in a subsequent operation. Fig. 433 shows an example of this sort in which the work is a lever having the shape shown at *A*. The bosses at each end are formed by means of suitable impressions in the dies, and the metal is compressed at *B*, *C*, *D* and *E* so that there is only a thin web remaining.

The lock *F* in this die is straight, and the lower plugs *C* and *E* come up flush with it. The upper plugs *B* and *D* do not come down quite to the lock. It is possible to make these plugs the same distance on each side of the lock, but there would be no particular gain in so doing. The diagram at *A* shows the work as it comes from the die with the fin *G* remaining on it. This fin is trimmed off and the work punched on a trimming press after the forging has been made.

In order to illustrate the appearance of the impression more clearly, a section *ZZ* is taken through the center of the boss to show the thin web at *H* and also the fin and gutter surrounding the piece at *K*. The section *XX* is taken through another portion of the die, and shows the web in the arm at *L*, which web is so made that it is equally distributed on both sides of the lock. The gutter and fin, however, are entirely in the upper impression.

There are several ways in which a forging can be made and one of them is usually somewhat better than the others. A decision should be reached as to which method is to be preferred, considering not only the amount of labor involved in making a die, but the durability of the die and the number of pieces which it can be expected to produce.

In Fig. 434 is shown at *A* and *B* the same piece of work made in two different ways. In the case *A* the work is forged on edge, while in the example *B* it is laid flat. The lock in both cases is straight, as shown in the sectional views. The impression for the boss *C* is in the upper die, while that at *D* is in both upper and lower halves. When metal is being forged and when there is a boss of considerable size on one side of the part, it is better practice to place this boss in the upper die, as the metal when struck has a tendency to rise up and fill the impression better than if carried downward and the boss made in the lower impression.

Another point of importance is the position of the large end of the forging. Two methods are shown at *E* and *F*. In the example *E* the small end connects with the sprue, while in the example *F* the large end is outward. The latter method is much to be preferred because the metal will flow more readily. These points are of importance and should be considered when laying out dies.

Use of The Fuller

When very irregular sections or large masses of metal are required in a forging at different points, it is a decided advantage to roughly shape the metal to an approximation of the form required. This is done by means of the "fuller," a diagram of which is shown in Fig. 435. The work is to be forged into the form *A*, and the lower impression *B* indicates the general appearance of the die. In order to provide sufficient metal to fill the portion *C*, a fuller is cut at *D* so as to shape the bar to approximately the form shown at *E*. After this has been done, there is sufficient metal in the portion *E* so that it will fill *C* during the process of forging.

Flat fullers, as shown at *F*, are often made when the forging is supposed to be round, but an oval or curved shape like that shown at *G* is very much better. The

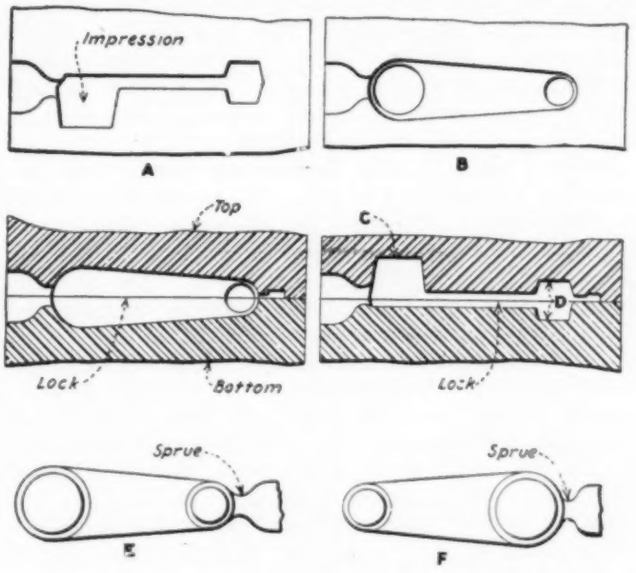


FIG. 434—POINTS IN DESIGN OF FORGING DIES

stock will be drawn more rapidly and there is less danger of "cold shuts." A cold shut is something similar to a seam in the metal, and is caused by the two portions not joining each other when turned over and compressed by the blow of the hammer. The stock when compressed should flow from the center first and not at the corners; and in order to make sure that this result will be obtained, there must be sufficient fullness of metal at the center so that it can be easily forced out by the hammer blow.

When the work is to be held closely to size or when the impressions are complicated in shape, it may be required to make two operations, using forming and finishing dies, both of which are in the same die-blocks. The nature of the work governs the shape of the die, and the necessity for forming and finishing would be

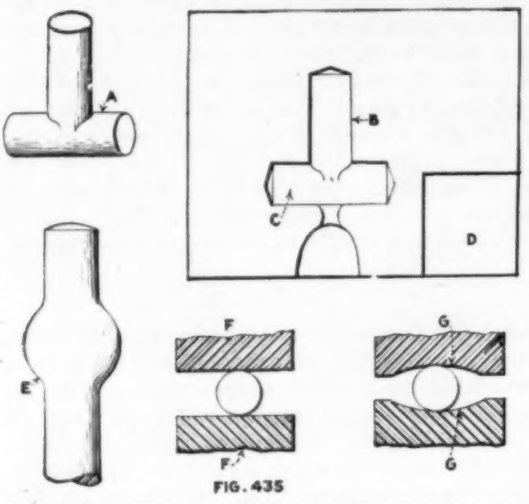


FIG. 435

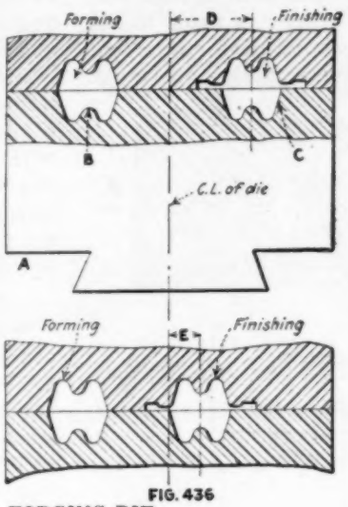


FIG. 436

FIG. 435—USE OF FULLER IN DIE-BLOCK. FIG. 436—FORGING DIE WITH TWO IMPRESSIONS

determined by the points that have been mentioned.

In the example shown at *A* in Fig. 436, the impression *B* is for forming and that at *C* for finishing. The center line of the die is shown, and attention is called to the position of the finishing die with respect to the center. The distance *D* is too great, and more accurate work can be obtained by placing the finishing die as near to the center as possible, so that the dimension is more like that shown at *E*. This is a very important point when making dies which have both forming and finishing operations. It is evident that there is less chance for an error when the finishing impression is placed as nearly central as possible.

Another example of a forging die having two impressions is shown in Fig. 437. The top die is shown at *A*. The edger at *B* roughs out the shape or breaks it down. The work is then placed in the forming impression *C* and afterward in the finisher *D*. The dies are set up so that they will register properly, by means of the match edges, which are so arranged that they are in perfect alignment when the impressions register one with the other. The view shown at *E* gives the appearance of the dies from the front, and the diagram *F* is a side view which shows the shape of the edger and general dimensions of it. The forging with fin attached before trimming is shown at *G*.

In Fig. 438 is shown a piece of work *A* and the die which produces it. The portion *B* is the edger, which is slightly different in upper and lower dies on account of the shape of the piece. The impression *C* is the forming die, while that at *D* is used for finishing. The flash outline is shown in one die at *E* and in the other at *F*, while the gutter may be noted at *G*. This is a very good example of a well designed and accurately finished drop-forging die.

We have endeavored to take up the points of importance in connection with the design of dies for forging steel. Our aim has been to illustrate the principles and show the importance of the various features in die design. In order, however, to be a thoroughly practical designer of drop-forging dies a man should have considerable experience in the forging of metal, as it is difficult to bring out all the important points in such a way that they can be thoroughly absorbed by a man unfamiliar with this class of work. Complicated forgings require special treatment, and work of large size may require several "heats" in order to form it to the desired shape. These latter matters are obviously beyond the scope of the tool designer, and yet the information we have given should be of value in enabling him to understand the fundamental principles governing the design of drop-forging dies.

We have taken up a number of matters in connection with the forging of steel, and in order to make this article more comprehensive it seems desirable to make mention of the process of forging brass and bronze. In the United States the forging of brass parts has not been widely adopted, except the making of fuse parts during the war. In Great Britain and on the European continent many non-ferrous metals are formed in dies. The process deserves more consideration than is usually accorded to it, and we therefore believe that a few of the principles involved may be of use to the tool designer.

In the first place the machine used for the process

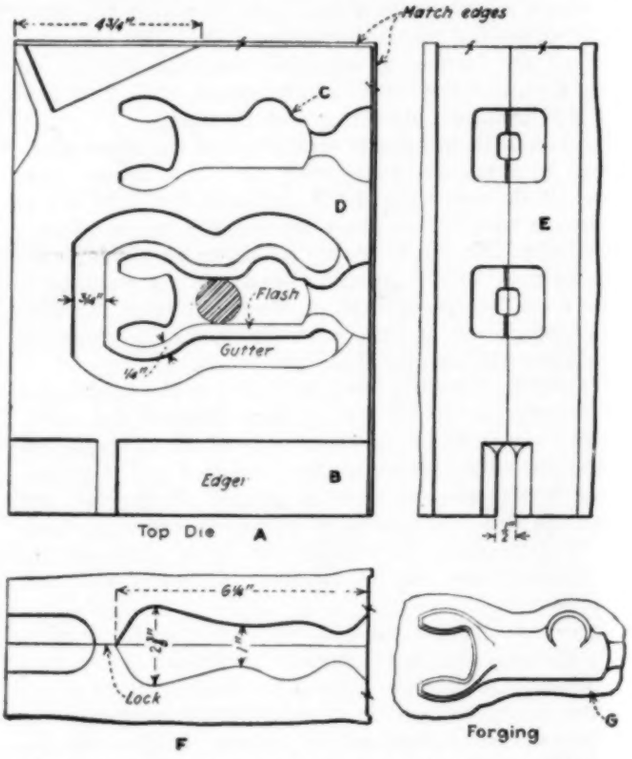


FIG. 437—FORGING DIE HAVING TWO IMPRESSIONS

is not a drop hammer, but a heavy single- or double-action press. Yellow brass mixtures of various kinds, as well as maganese or tobin bronze, can be forged

to advantage. Castings can be made to an approximation of the shape desired, and afterwards "struck up" in dies; but a better method is to use the process of extrusion to obtain special forms and then work the part up in dies to the desired shape. The temperatures required vary from about 1,250 to 1,300 deg. F., but very accurate control of the heating is not important. The temperature can be judged approximately by the color

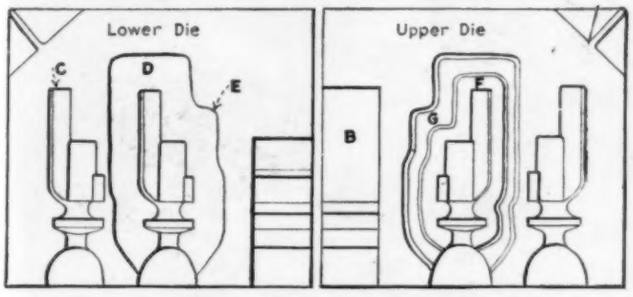


FIG. 438—UPPER AND LOWER FORMING AND FINISHING DIES

of the work, making it unnecessary to use pyrometers.

Dies for forging brass should be lubricated, and it is customary to swab them with cylinder oil, which the operator applies with a long-handled swab. The oil is necessary in order to prevent the dies from wearing too rapidly, on account of the excessive pressure. Occasionally it is found an advantage to add about one per cent of the powdered graphite to the cylinder oil, so that more body is obtained to resist the pressure. It is possible to hold brass forgings within an accuracy of ± 0.002 or 0.003 inches.

As there is a certain amount of variation in the thickness of the brass used, it is necessary to protect the dies from injury. Several methods are possible for accomplishing this result, a shear block or pin of some sort being the most logical method. Providing a shear pin in the crank of the press so that it will shear off before any damage is done, is probably as good a way as any to overcome the trouble.

In reality the process of making brass forgings consists of squeezing the heated metal between a pair of dies, thus causing it to flow sufficiently to fill the upper and lower impressions. Blanks are often made from bar stock when the work is simple, but the extrusion process is also used when work is of more complicated shapes. Dies can be expected to produce from 10,000 to 20,000 pieces, according to the nature of the work. Under good conditions from 6,000 to 8,000 pieces can be made in ten hours. If metal is required to flow a considerable distance, a double-action press should be used, the first movement to extrude the blank and the second to bring down the plunger through the upper die, thus causing the metal to flow.

Air vents should be provided so that the air can escape, in order not to hinder the flow of the metal and fill the die space. No. 70 drilled holes are often used for this purpose, and the small "needles" which are left in the holes are forced out by the compression at each operation so that they do not cause trouble. In the manufacture of dies for brass forgings the contact parts are made of high-speed steel, as they will withstand the temperature better than carbon steel.

In order to illustrate the principles in graphic form, Fig. 439 is given. In the example *A* the work is placed in the die *B*, and the upper die *C* comes down upon it to bring it into the approximate shape of the finished forging. It will be remembered that the work is done in a heavy punch press.

In order to illustrate the difference between the process of forming dies and machining, a diagram is shown at *D* in which the work *E* is manufactured from hexagon stock on a screw machine, using a forming tool *F* and a cutting-off tool *G*. When manufactured by means of the forging process, a billet can be used like that shown at *H*, and the work produced so that it appears as shown at *K*. The fin *L* is cut off by trimming dies after the piece has been formed.

The work shown at *M* is a cup-shaped forging which is made from the bar by means of the dies shown at *N*. The lower die is cut out as indicated at *O* to the form required, and the work is squeezed until it fills the dies and overflows at *P*. A "shedder" is provided in the upper die, as shown at *Q*, and an ejector *R* in the lower die. The portions *S* and *T* are made of high-speed steel to withstand the heat. Registry is accomplished by the sleeve *U*, which locates over the ring *V* in closing.

The principle of operation on a double-acting press is clearly shown at *W*. The dies come together in the same manner as those previously shown, and after the faces have touched each other the plunger *X* comes down and forces the metal into the die. In all probability the process of brass forging will come into prominence more and more in the manufacture of small brass parts where they are produced in quantities. An advantage of the process is the accuracy and rapidity that can be obtained in manufacture.

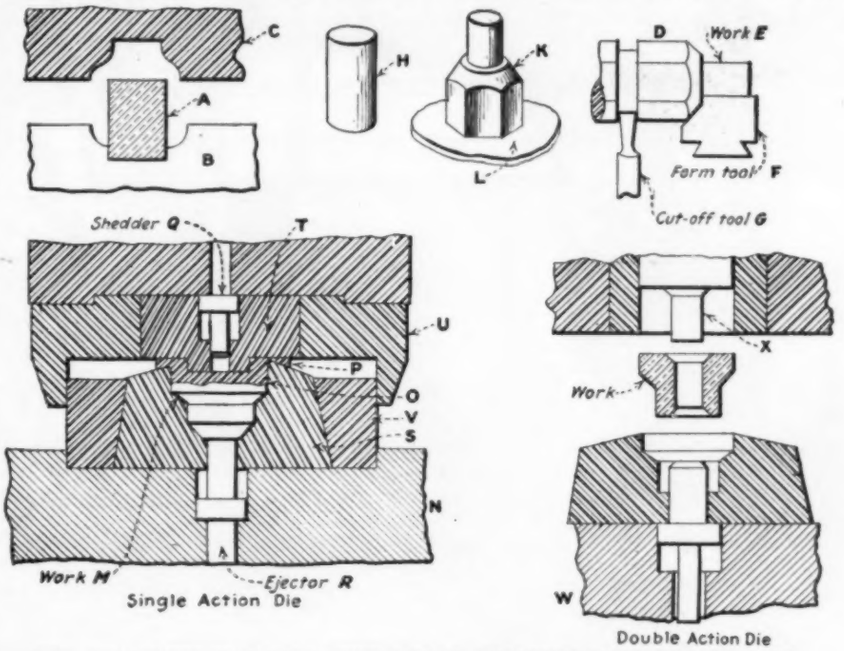
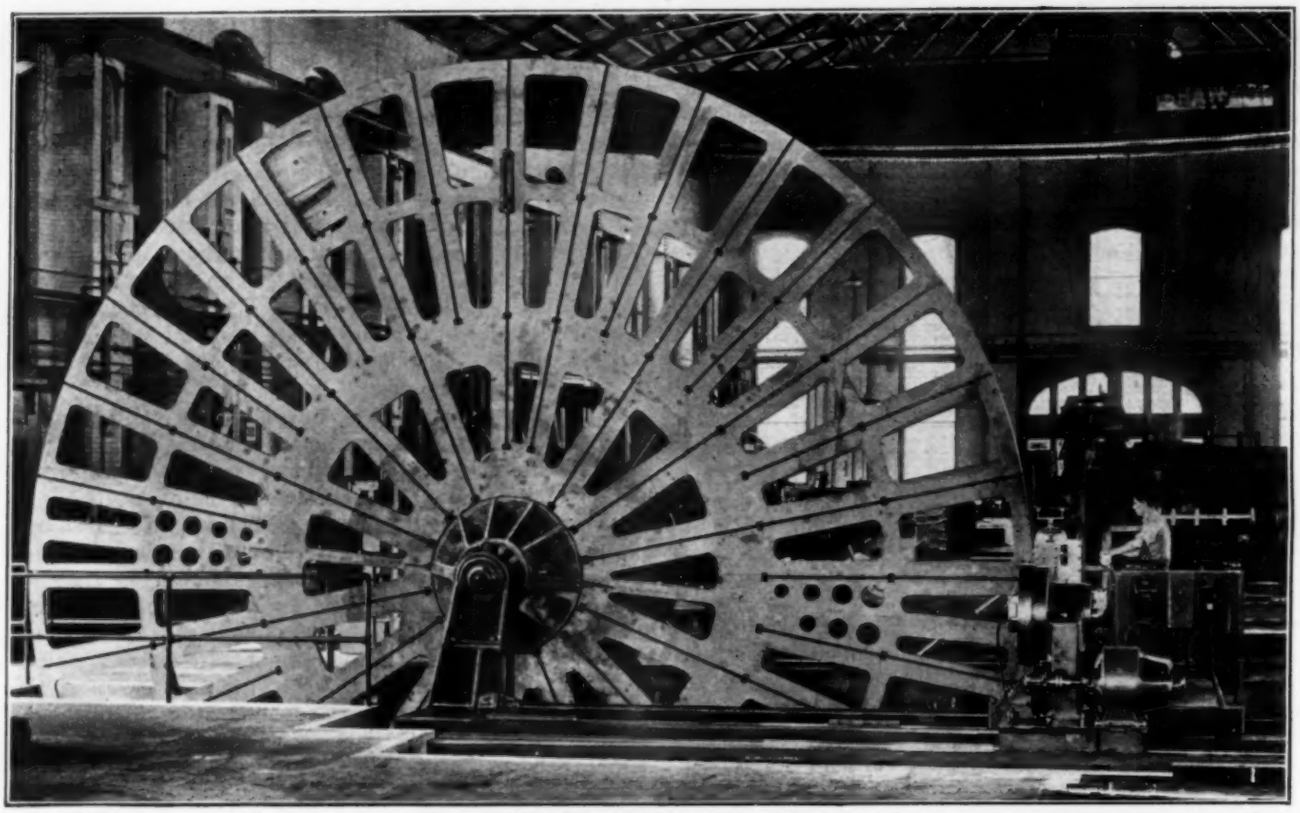


FIG. 439—METHOD OF FORGING BRASS, SHOWING TYPE OF DIE USED



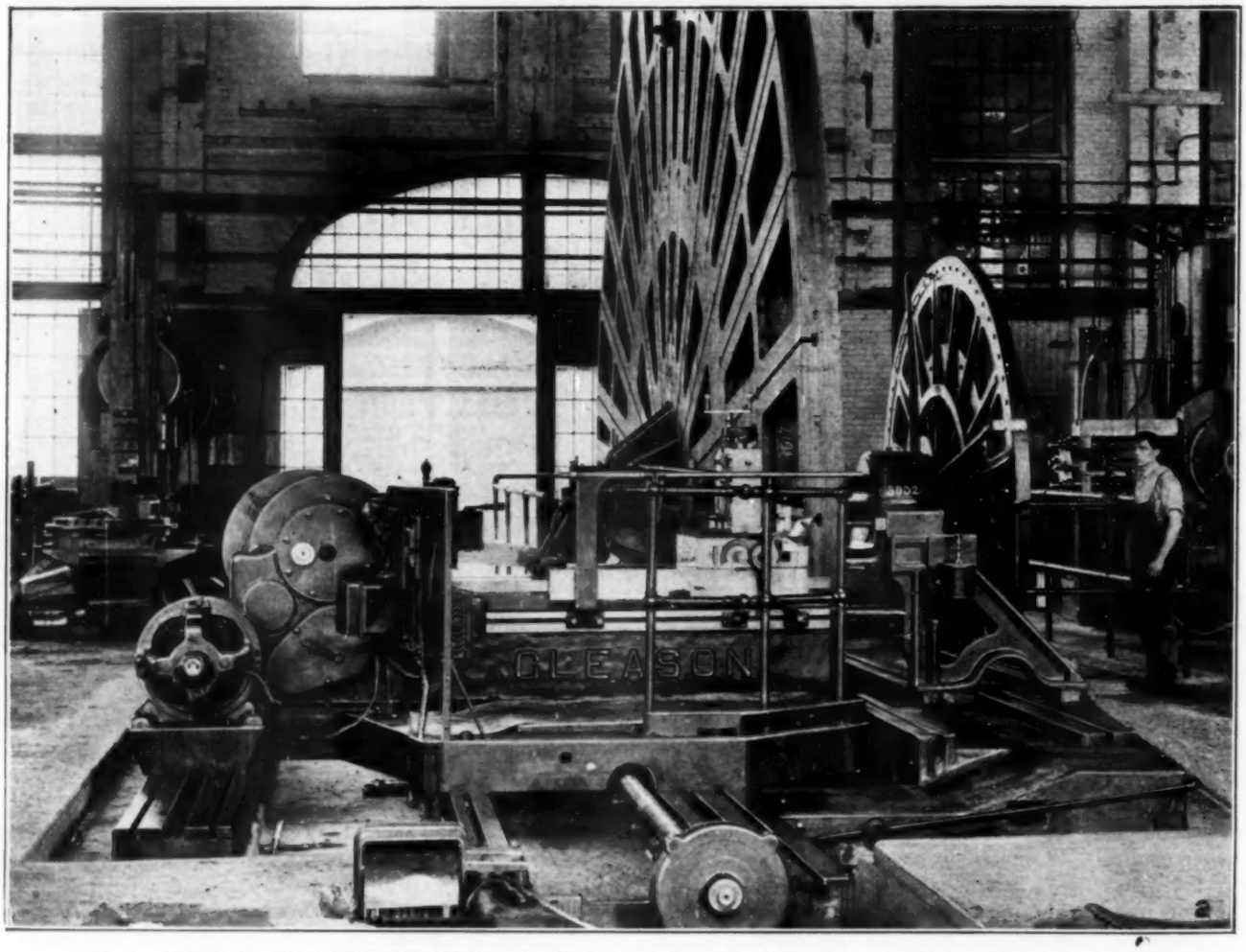


FIG. 1—GLEASON GEAR PLANER AT WATERTOWN ARSENAL. FIG. 2—SIDE VIEW OF SAME MACHINE

Large Gear Planer at Watertown Arsenal

At the Watertown Arsenal, Watertown, Mass., are built among other things the mounts for large guns for various kinds of service. Some of these mounts have large circular traversing racks for swinging the guns to different points, the largest one at present being 32 ft. pitch diameter and used on a 16-in. Barbette gun carriage. In order to cut these racks rapidly and accurately, the gear planer illustrated herewith in Figs. 1 and 2 was built by the Gleason Works, Rochester, N. Y. and has recently been installed. The faceplate was, however, designed and built at the Watertown Arsenal, to suit the work required.

This machine has a capacity for cutting both internal and external spur gears having a minimum pitch diameter of 5 ft. and a maximum diameter of 41 ft., with no limit as to the pitch to be cut. The stroke can be varied from 4 to 15 in. The cast-iron faceplate is 32 ft. in diameter, made in halves, the total finished weight being 18 tons. It is attached to the front end of the main spindle, which rests in two main bearings and one outboard bearing. Extensions allow gears up to 41 ft. pitch diameter to be cut. An index wormwheel 12 ft. in diameter is attached to the back of the spindle.

The indexing mechanism is driven by a constant-speed, non-reversible, 1-hp. motor running at 1,700 r.p.m. In order to reduce the friction on the worm gearing used for indexing, large roller bearings are provided, consisting of inner and outer sleeves and having 1-in. rollers, 12 in. in length. The planing mechanism is so arranged that either form tools or plain tools guided by special forms can be used, depending on the shape of the teeth to be cut.

The two main bearings form part of an upright frame bolted firmly to a bedplate resting on concrete foundations. The outboard bearing is also attached to a bedplate resting on a firm foundation. A third bedplate is provided for the base of the tool slide. This base can be traversed within a range of from 2½ to 20½ ft. from the center of the faceplate, by means of a screw driven by a 5-hp. constant-speed motor provided with reversible control.

To prevent deflection of the faceplate under the cut, a thrust brace is provided which can be moved to either of the three circumferential ribs on the back. This brace is supported in a bearing secured to the rear baseplate, and is so controlled electrically that the operator of the machine can by means of a remote control, withdraw it ⅛ in. while the machine is indexing. On completion of the indexing, the brace can be again brought into contact with the faceplate by the remote control.

The main drive is from a 10-hp. variable-speed motor having a range of from 300 to 1,200 r.p.m. By means of change gears and the speed controller, the strokes of the tool ram can be varied from 6.6 to 66 per minute.

Cutting compound is delivered by a motor-driven pump. The toolslide is provided with automatic feed and has proper support for the various kinds of forms used in planing teeth, also housings for the rolls that engage the forms. The total weight of this machine is 200 tons. The extreme height with all extensions attached is 24 ft. 6 in. The length is 53 ft. and the width 20 feet.

The machine is operated from a platform attached to the base, and on one side of the platform is a panel containing the control switches, automatic control and means for complete manipulation electrically. As the traversing motor travels with the sliding base, the cables furnishing the current are coiled on a spring-actuated drum which automatically takes in the slack or allows the cables to be paid out, according to the direction of traverse.

Job Welding Shop Problems

By S. W. Miller

By a job shop is meant a shop which takes in any kind of work that is brought to it. The work may be large or small, easy or difficult, and there may be much of one kind or there may be no two jobs alike. The job welding shop comes under this specification but has an additional difference. The work is almost entirely repair work. In repair work of any nature, the objects are to have the repaired part strong enough to stand the service required of it, and to do it at a price as low as possible consistent with good workmanship and a fair profit. There are many difficulties in accomplishing this result in a job welding shop. In considering these difficulties, we will confine our attention to repair work, because in production work the difficulties can be overcome in the course of a short time, and after this has been done, the rest of the work is comparatively easy.

The difficulties in a job welding shop may be classified as follows: (1) The work itself; (2) the varied natures of metals that are of the same general type; (3) financial problems; (4) guarantees on the work.

Work

The first head may be sub-divided into the following: Preparation; welding; finishing. The preparation of the work involves the making of the V, the method of lining up the work, and the arranging for and taking care of the expansion and contraction.

The welding covers the decision as to whether gas or electric welding be employed, and upon this decision somewhat depends the preparation. The method of preheating really should be considered in connection with the welding, although it is important enough in some cases to be considered separately.

The method of finishing the work, if finishing be necessary, as do all the other operations, depends on the facilities on hand. It is difficult to lay down general rules for any of these matters and it is probably best to consider what has been done in individual cases.

Varied Nature of Metals of Same General Type

Under the second heading, it should be remembered that in a production job the material used can be specified so that uniformity can be obtained, which enables the welder to use the same methods and practices at all times. In repair work, however, not only are the materials, for instance, cast iron, not uniform, but in many cases it is impossible to determine before the welding is started how the material is going to act during the welding process, and sometimes changes in methods have to be made in order to overcome difficulties of this nature that could not be anticipated.

The only thing that will guide a welder under such adverse conditions is experience, and to use this experience the welder's memory must be good and his observation keen.

The job shop is called on to handle all metals and it is seldom that one finds a welder who is able to do all of them well and still rarer to find one who is capable of doing all-around welding with both gas torch and electric arc.

It is sometimes difficult to distinguish between cast iron, malleable iron and cast steel. It is frequently impossible to distinguish between the various brass and bronze alloys and many failures have occurred because of these troubles. Similar difficulties exist with other metals, so that the job shop, to be succcessful, must have a wider knowledge of metals and their characteristics than any other kind of a shop.

Financial Problems

Third, the majority of job shops do not have any real knowledge of their costs, and it is frequently the case where there are a number of competitors in the same city, prices will be cut and recut until the work is being done at an actual loss by everybody. Such a condition is bad for the welding industry, but it will not be overcome until such shops see the importance of knowing what the work costs them. To do this is not so difficult, but does require a proper system of bookkeeping and a simple accounting method.

The items that are most frequently overlooked are those that are usually called overhead expenses, such as insurance, taxes, repairs of apparatus, and advertising. I do not mean that these expenses are not paid, but that they are not included in the charges made for the work in an intelligent way. Of course if the real cost of the work being done is not known, it is impossible to say what the charges should be, and charges must include a profit over all expenses or else the business will fail.

In connection with the financial end of the business, the treatment of the customer is of vital importance. A satisfied customer is the biggest asset of the business. Of course a customer cannot be satisfied unless the work is done properly, and at a reasonable price. The most essential thing, however, is to do the work properly even if in some cases it has to be done at a loss, and as a matter of policy, I believe it is wrong to do cheap work, that is, work which is deliberately so done, even with the understanding that first-class work is not needed. On the other hand, if the welder is so unfortunate as to do a piece of work badly, the best policy is to honestly admit it and explain why. There are so many jobs that come to the welding shop that have never been done before that it is no wonder that failures sometimes occur and honesty in this, as well as in all other cases, is the best policy. I speak of these things in some detail because they are many times overlooked or not understood or appreciated.

Guarantees

A welding shop is frequently asked if it guarantees its work, and such shops frequently advertise that they guarantee all jobs. A general statement to the effect that all work is guaranteed in reality means nothing and there should be some specific form of guarantee covering all usual cases.

It is also well to know that, in all probability, a general statement as to any guarantee is not legally effective unless it is specifically called to the attention of the customer before the work is undertaken, and if it is not intended to guarantee the work, the customer should be advised of this at the time the work is taken in, and in important cases the further precaution of notifying him in writing should be taken.

Whatever is done in the way of guarantees should be done as a matter of principle, and the policy should be followed strictly and altered only as experience indicates that changes may be safely made.

As in all other work, welding has its tragical and humorous sides. The tragical may be well represented by the accidents that have occurred either through lack of knowledge or pure carelessness, as when tanks that have contained oil, gasoline or other explosives have been worked on with a cutting or welding torch. It is equally dangerous to work on them with an electric arc. Explosions have occurred even after a tank has been washed out with water, or steamed out, so that the only safe way is to keep the tank as full of water as possible while the work is being done. It should first be filled entirely, care being taken to see that all pockets are filled. The water can then be let out just enough so that the welding can be done.

The dangers of looking at the electric arc are well known to you, and in all cases precautions should be taken so that even side flashes from the arc may not get to anyone's eyes.

There are many humorous questions asked by customers; that is, they are humorous to us. One of these questions is quite frequent, that is, whether cast iron can be welded. Courtesy and tact demand that we should not smile under such conditions, but that a careful explanation of the principles of fusion welding be given, so that the customer may understand that all metals may be joined together by these processes. Then his idea of welding will be broadened and his confidence in it increased. It is even sometimes necessary to demonstrate to the customer that metals can actually be melted together. As a matter of fact, we can all be asked questions in connection with welding which we are unable to answer.

The Field of Association Publications

It has long been a question as to both the ethics and the desirability of associations or societies entering the publishing business as a financial enterprise. Bulletins, containing news of the society and more formal transactions, to put on record the proceedings of the society so that the valuable information presented can be preserved for future use, are essential to every technical organization. But when the society publication enters the field of the standard periodical, even when the sole desire is to help the society to become self-supporting and of even greater value, several real problems are presented.

Such a problem faced the Associated Advertising Clubs of the World, an association devoted to making advertising of the greatest value to all. After serious consideration on the part of the managers, this association has decided to "clean up its own backyard" as it expresses it, and withdraw from the field of regular publications. Hereafter their official organ will carry no advertising except that pertaining to the activities of the association. This will change the whole character of the publication and take it out of the general periodical field, but the managers feel that it is the best policy for this association as well as for others which are similarly situated.

Their decision is well worth careful consideration by all managers of association publications.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Angles of Cutting Tools

BY J. HERRON

I was very much interested in the article by M. Tolliver on page 231 of *American Machinist*. The discrepancies he pointed out were so striking that I looked up page 218, Vol. 55, of *American Machinist* and did some speculating on my own account.

The tabulation to which Mr. Tolliver referred is given here in a different form, so as to bring in a somewhat clearer view the things I wish to point out.

	Top rake, degrees	Clearance at point, degrees	Roughing speed	Roughing feed	Finishing speed	Finishing feed	Amount of metal removed in unit of time. Roughly	Contained angle, degrees
A	18	5	23	1/32	23	1/16	3 1/2	67
B	15	6	28	1/16	28	1/16	1 3/4	69
C	12	10	15	1/8	15	1/8	7 1/2	68
D	12	15	18	1/4	18	1/4	4 1/2	63
E	8–10	7	40	1/8	40	1/8	5	73-75
F	8	6	25	1/4	25	1/2	6 1/4	76
G	8	6	16	1/32	20 1/2	1/32	1 1/2	76
H	8	5	26	1/16	26	1/16	8 1/8	77
I	7	8	12–20	1/2	12–20	1/4	3–5	75
K	6	6	14	1/8	12	1/8	1 3/4	78
L	6	7	16	1/16	16	1/8	5	77
M	6	4	30	1/16	30	1/16	1 7/8	80
N	5	7	55	1/8	50	1/8	6 7/8	78
O	4	6	18	1/8	18	1/8	2 1/4	80
P	4	4 1/2	24	1/8	24	1/4	3	81 1/2
Q	2	7	19 3/4	1/16	19 3/4	1/16	6 1/4	81
R	2	7	30	1/8	30	1/8	11 1/4	81

The first column of this table gives the top rake of the tool in degrees. The second is the clearance at the point. The third gives the contained angle of the tool. The fourth and fifth give the roughing speeds and feeds. The sixth and seventh, the finishing feeds and speeds; and the eighth, the product of roughing speed and feed.

Looking over the first column it will be noticed that the top rake varies between 18 and 2 deg. The second column shows that the clearance varies between 15 and 4. The range of roughing speeds is from 55 to 14 ft. per minute. The roughing feeds vary between 1/8 and 1/16 in. It will be seen that the finishing speeds are as a rule the same as the roughing speeds, but now and then one will be found slightly more, and occasionally one slightly less, than the corresponding roughing speed. The same is true in regard to the finishing feeds. As a rule these feeds are the same as those used for roughing, but sometimes they are more and sometimes less.

I am going out from the supposition that the amount of metal to be removed is practically the same on all tires. I dare say this assumption is nearly, if not quite, correct; but if there should be a wide difference in the amount of metal to be removed from various tires, I would naturally ask why there should be such a difference. If one tire can be forged with a small amount of metal to be removed, why shouldn't it be possible to forge another tire the same way? There is, of course, a certain amount of difference between individual tires; but where a general practice is developed for the boring out of tires, we may, of course, expect that the maximum amount of metal to be removed is the basis of such practice.

Assuming then, that the depth of cut is the same in all cases, we can say that the product of roughing feed and roughing speed, will be a measure of the amount of metal removed in a unit of time. We find in our tabulation that this amount of metal is as little as 1 1/2 or as much as 11 1/4, and one may say that all possible combinations between these extremes are found.

Looking over these figures one wonders what may be the reason why there are such startling differences in practice in different shops. The difference in amount of metal may be explained by the fact that there is a powerful machine in one shop, where another shop must get along with an old and out-of-date machine not capable of taking heavy cuts. But, if this is so, then why is a much sturdier tool required to cut 3 cu.in. than one to cut 7 1/2? The 7 1/2 cu.in. are removed with a tool having a top rake of 12 deg., a clearance of 10 deg. and a contained angle of 68 deg., whereas 3 cu.in. are removed with a tool having a top rake of 4 deg., a clearance of 4 1/2 deg. and a contained angle of 81 1/2 deg. Again, we find on line *D* that 4 1/2 cu.in. are removed by means of a fragile tool with a contained angle of 63 deg., whereas in the case of line *L*, 5 in. are removed with a tool of 77 deg. angle.

One may ask why it is necessary to run at such a low speed as 14 ft. per minute and with 1/8-in. feed, as is the case on line *K*, if in another case, (line *N*) a speed of 55 ft. or nearly 4 times as much is used and with the same amount of feed per revolution. Again, if a cut can be taken at 30 ft. with a feed of 1/8 in. (see *R*), why must the speed be reduced to 19 3/4 ft. per minute when a feed of 1/16 in. is taken, as is the case in *Q*? One could go on asking such questions, because it would be difficult to find a greater lack of uniformity than shown in this tabulation.

As Mr. Tolliver says, surely it cannot be that everybody is right. Some one practice must be better than another and probably one is the best or maybe the least bad.

It is surprising that there should be two shops which vary in their practice on important operations to any great extent, considering the facilities which are offered for interchange of ideas. When one can pick out seventeen shops all doing the same kind of work, with the same kind of machines and the same kind of tools and working on the same material, and then find that there

is not only no uniformity but extreme differences in all the elements of the operations, one begins to wonder how such a thing can happen. The writer does not believe that this lack of uniformity is confined to railroad shops but is inclined to doubt whether it exists, to the same extent, in other types of large machine shops. If, in the future, I read about railroads farming out some of their work, I'll feel as if there is at least *one* good reason for it, and if I ever read again about the special training required of the railroad shop men I'll turn to my tabulation and smile.

It seems to be a fact in machine shop practice that every little king and potentate has his own laws, his own customs, his own habits and his own practices, and is proud of them. There are not many industries apart from the machine shop where such difference in practice could persist. The concern holding onto the lesser practice would soon be out of business. What there is in the machine shop that makes people hang on tenaciously to their own individual practice and makes them defend, as if their lives depend on it, any old way or custom they may have is more than the writer can tell.

Practical men have often sneered at the work of the efficiency engineer and with some excuse and maybe *some* reason, but if ever the efficiency engineer should want to get back at the sneering practical man, all he has to do is point to the tabulation herewith.

A Speedy Home-Made Drill Fixture

By H. E. Crawford

As our shop is a small job shop, it is only natural that we should get the job of drilling the holes in the brass cap shown at *A* in Figs. 1 and 2. As the holes have to be evenly spaced and in practically perfect alignment, the foreman devised a semi-automatic fixture.

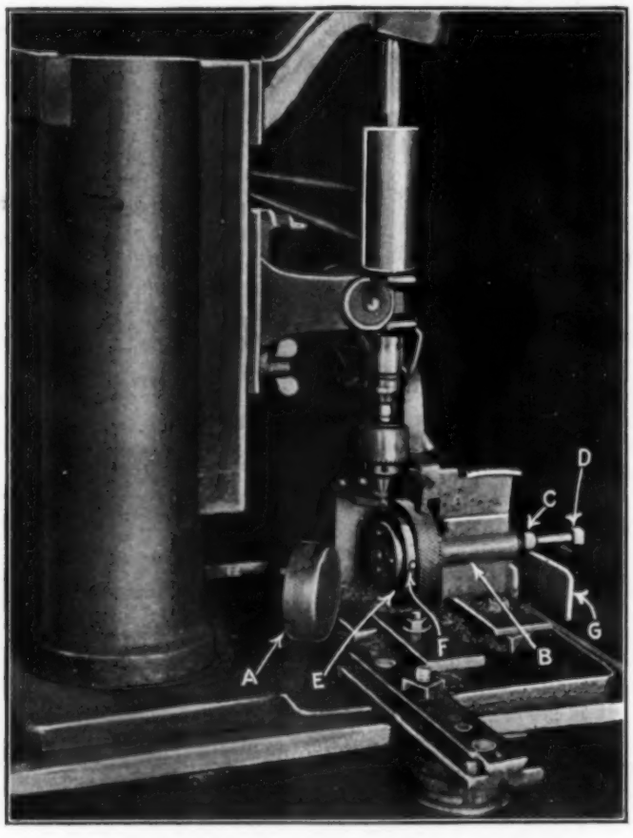


FIG. 1—REAR VIEW OF DRILLING FIXTURE

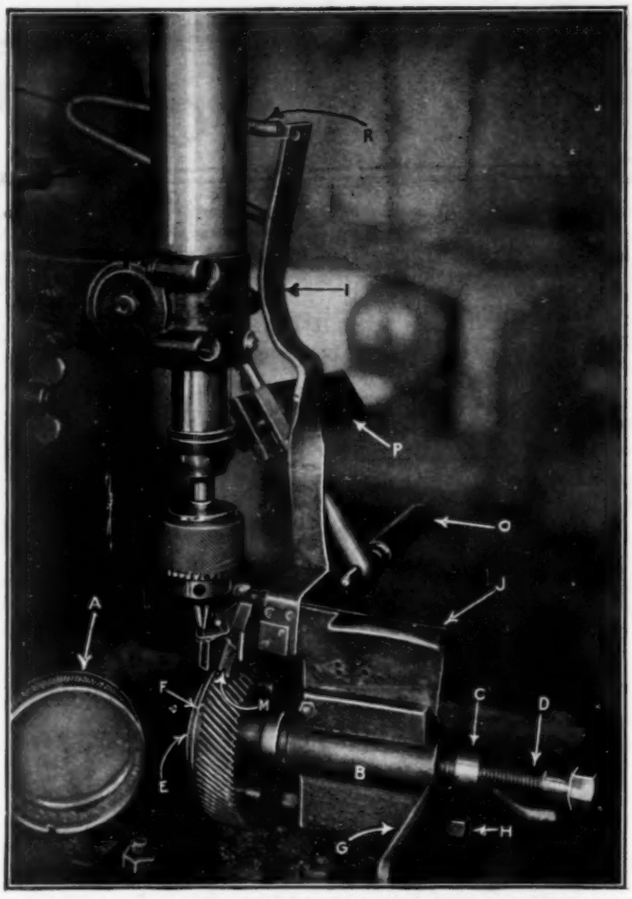


FIG. 2—FRONT VIEW SHOWING OPERATING MECHANISM

The casting *B*, Figs. 1 and 2, was bored to receive the shaft *C*, which in turn was drilled and tapped to receive the capscrew *D*. The plate *E* was then turned and drilled at three equi-distant points on the circumference, the holes extending through to the hole in the center of the plate. Then three pins similar to the one shown at *F* were slipped in the holes and the plate was attached to an old spiral gear which was used for an index plate. The end of shaft *C* was pressed into the gear and then assembled to the casting *B* by the simple process of slipping the shaft into the hole. It is held in place by the plate *G*, which is ground on the end so that it will slip into any one of the grooves shown. This plate is slotted so that the hole *H*, Fig. 2, will hold the shaft in place and yet allow it to be slipped back and forth for adjustment in another groove.

The screw *D* is long enough to project through the gear and into the plate *E*, and is tapered on the end so that when it is screwed in, it forces the pins *F* out. Plate *E* is turned to a fit for the brass cap, and when the screw *D* is screwed in, the pins are forced out, holding the cap in place. Withdrawing the screw allows the pins to release the cap.

Piece *I*, which is a strip of bar iron twisted to the shape shown, is riveted to the plate *J* and this is attached to the casting *B* by a screw which serves as a hinge. The small piece *M*, which has a pin on the under side that fits into the grooves between the gear teeth, is also held by a screw which acts as a hinge. This locates the piece for drilling, and is held down by the action of a small coil spring, as shown.

When the lever *O* is raised, the block *P* that is attached to it rides in the twist in the bar *I*, forcing it back and raising the piece *M*, thus dragging the pin over into the next groove. When the lever is lowered, the bar *I* is pulled forward by the spring *R*, and the spiral gear, together with the piece of work, is rotated the required distance. As the action of the lever is primarily to raise and lower the machine spindle, the whole operation is done in one movement. The action of rotating the work is accomplished before the drill enters the piece.

The brass cap is 3¼ in. in diameter, with a $\frac{1}{16}$-in. wall. The drill is a No. 53. Each cap contains 358 holes and we drill six caps per hour, a total of 2,148 holes per hour.

Some Modern Railroad Shop Equipment

By I. B. Rich

Just as an evidence that some railroad shops at least have modern shop equipment, I am showing a few illustrations from the New York, New Haven & Hartford Railroad shop at Readville, Mass. First is a large Landis grinding machine for piston rods and similar work and is used for truing worn piston rods instead of trying to turn or file them as is too often done. This method gets the rod round in the shortest time and without removing more metal than is necessary. The machine is shown in Fig. 1 set up with one of the worn piston rods in place for finishing and truing.

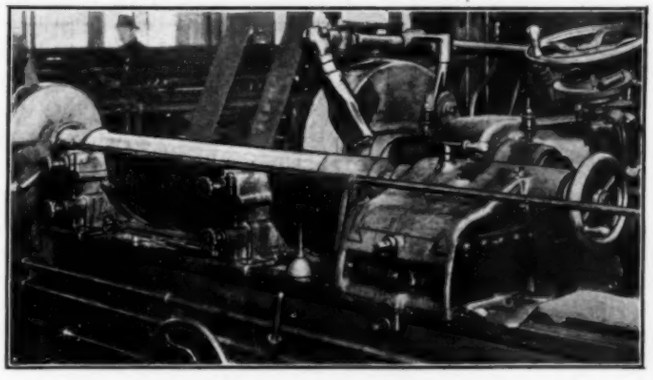


FIG. 1—GRINDING PISTON RODS

Then comes the heat-treatment room, Fig. 2, for valve motion pins and other parts which require case-hardening or other treatment. It is well equipped with a gas furnace at the right, and with two American continuous gas furnaces for drawing the temper, at the left. Quenching tanks of different sizes and shapes can also be seen, all being provided with steam pipes for warming the water to the desired temperature. This is a very complete little department and has proved much more satisfactory than attempting such work in the blacksmith shop, as is very frequently the case.

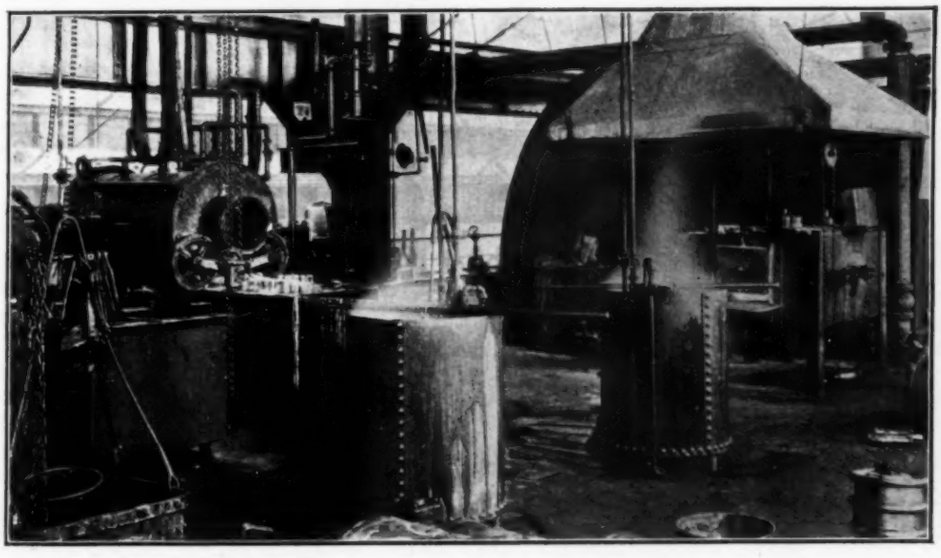


FIG. 2—HEAT-TREATING EQUIPMENT

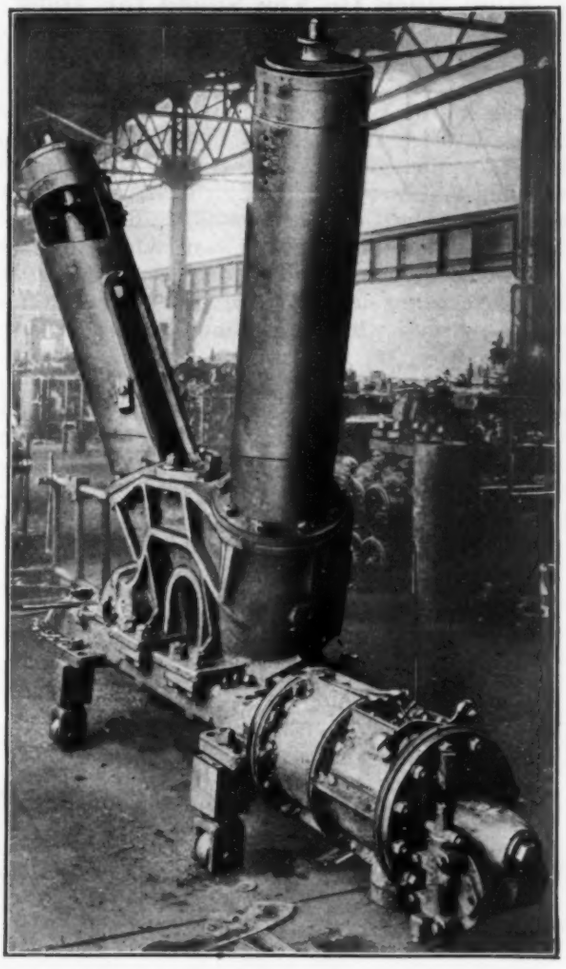


FIG. 3—A NEW REPAIR JOB—THE STOKER

A third evidence of modern equipment is shown in Fig. 3. This is a modern mechanical stoker for one of the big locomotives. The stoker is mounted on large casters for easy handling in the shop and is taken apart and assembled in the position shown. Mechanical stokers add a new piece of apparatus to the shop man's burden, but he is handling it, just as he handles everything else which comes along, as best he can.

How Much Do You Spend for Tools and Equipment?

By A. W. Field

At the end of a period or at the close of the year a question is often asked: "How much do you spend for tools and equipment?" The answer to this question is something that every superintendent and every manager wants to know at one time or another. But the question is somewhat like placing "the cart before the horse," for it would be more appropriate, from the standpoint of either expense or investment, if the question were put: "How much should I spend for tools and equipment?"

During the writer's experience his work has been in factories where equipment, especially small tools, were ordered at random or at the instigation of some department head without due investigation as to the merits of the expenditure. As an illustration, a foreman may have some difficulty with a piece of work which has been produced for some time past by more or less crude methods. He decides suddenly that a special tool, jig or fixture should be made to do a particular operation on this part, and at once places a requisition for the tool. The requisition is approved and the equipment made.

Upon investigating the conditions, it is found that the expenditure was not warranted for several reasons. Comparatively few pieces may be produced in a year's time, or to employ the special equipment may add time to the operation, (as often happens), and increase instead of decrease the cost. It may also be discovered that the accuracy desired can be obtained by the former "hand method" of producing and that the saving effected by adopting the new equipment may be nil, and therefore the chance to make the investment a paying proposition is eliminated.

In considering an expenditure, whether it be for $5 or $5,000, the natural question is "Will it pay for itself?" Let us suppose that an order is placed for a jig to do a certain operation. It is but natural for the men responsible for the expenditure to want to know first, what the cost is going to be; and second, in what length of time will the saving effected pay for the cost of the jig.

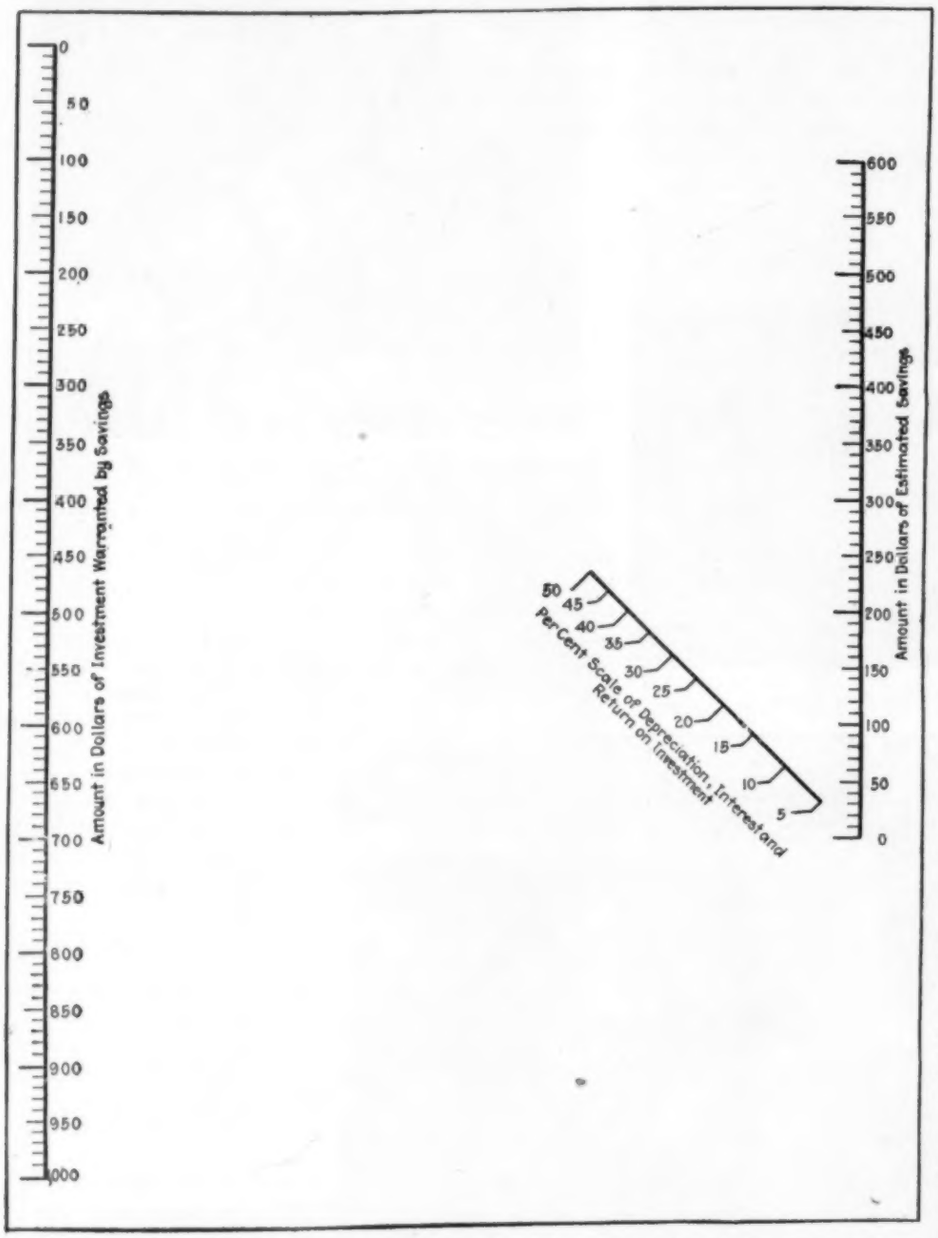


CHART FOR FINDING THE AMOUNT OF MONEY TO BE EXPENDED FOR TOOL EQUIPMENT WHEN THE ESTIMATED SAVING, DEPRECIATION, INTEREST AND RATE OF RETURN ON INVESTMENT ARE KNOWN

Let us assume that by the present method of doing the work it is costing an amount of money which can be reduced $200 per year, this being the saving estimated at the time the order is placed. Let us assume, also, that 10 per cent for depreciation and interest is to be considered and in addition a 15 per cent return on the investment is desired, as this particular tool is of such a character that its life will be comparatively short. The problem, then, is to determine what amount can be expended judiciously upon such a piece of equipment.

By referring to the accompanying chart, this amount is readily found. First, locate the estimated saving on the right-hand scale, which in this case is $200 per year. Next, locate the total per cent, in this case 25 per cent, on the diagonal scale and connect these points by a straightedge. On the left-hand scale at the intersection of the straightedge we find $810. This is the maximum amount that should be expended for the equipment upon the basis used. It represents the principal for which $200 is the interest per year at 25 per cent.

With a saving of $200 per year, it would, of course, require four years for the jig to pay for itself. If, in the meantime, the jig was for any reason disqualified for service, the loss would be proportionate to the useful life and service of the jig. In estimating the saving, therefore, it is important that the useful life of the equipment be considered as well as the possible replacement of the part for which it is to be used by another part, thereby making the equipment obsolete long before its allotted time.

The same reasoning applies to machinery and other equipment as it does to small tools and fixtures. Suppose, for example, that a part is now being produced in quantities at a cost of $1,000 per year. It is estimated that a saving of $500 can be affected by adopting a new machine. But in operating this machine the cost of operation will be $350 more per annum than the cost of operating the former equipment. The actual saving therefore is only $150. To this, then, must be added $100 for new tool equipment which is not available for use and must be made. The saving will then be decreased to $50.

Now, while the machine is special, it may be so constructed that it would have a possible life of 20 years, which is a long time. The depreciation and interest would not need to be as heavy as in the former case cited, but other conditions make it desirable that the machine pay for itself within five years' time.

The cost of the new machines, let us say will be $1,500. Therefore, on a saving of $50 per year, the machine would require 30 years to pay for itself! On the other hand, if we assume interest and depreciation at 8 per cent and a return on the investment of 32 per cent, we have a total of 40 per cent. Locating on the chart 40 per cent and $50 saving, we find that the expenditure warranted is only $125. It is obvious that, unless other conditions make a losing investment worth while, the outlay of $1,500 for the new machine would be unwarranted, if it is based upon a saving of only $50 per year.

In a great many shops and factories investments such as these are found and are usually known as "white elephants." A little consideration as to the probable saving, depreciation, interest and initial cost of the proposed new equipment would have indicated at once that such an investment or expenditure would not be a paying proposition and the "white elephant" would never have been born. In the present time of making the dollar go further and affecting economies wherever possible, the chart will serve as a ready aid in at least indicating in what manner new expenditures for equipment should be made.

Recessing Tool for Screw Machine—Discussion

BY C. G. SPICER

Referring to the Editor's note, at the bottom of my article under the above title on page 76 of *American Machinist*, perhaps the fault was mine in that I may not have made the drawing clear.

When the tool is in position to cut the recess, it is in advance of the holder a distance equal to its own width, so that the chips easily clear themselves.

The comment shows me that *American Machinist* is alert, which I appreciate.

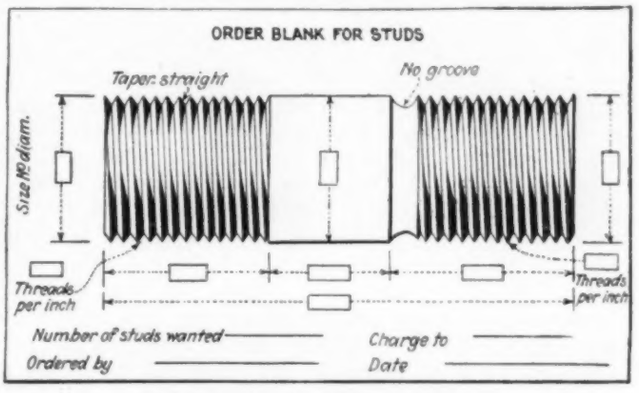
Railroad Shop Methods of Fitting Studs and Plugs

BY F. M. A'HEARN

The article on page 553 Vol. 56, of *American Machinist*, more especially that part on page 555, illustrated by Fig. 12, showing the practice of the Southern Pacific Railroad shops in fitting boiler washout plugs, gives a simple and sure way of avoiding trouble in renewing washout plugs.

The writer has had experience with a similar method, differing, however, in the use of taps having a taper of 1 and 1½ in. in 12 in. instead of the taper of 1¼ in. as described in the article already mentioned. The 1½-in. taper brings the plugs to varying diameters in even steps of ⅛ in. each. This seems less complicated in sizing the plugs for threading.

A similar method may be used in the renewal of boiler studs. In this case the taps are made with a taper of ¾ in. in 12 in. and by varying the number sizes of



SAMPLE ORDER FORM FOR STUDS

INSTRUCTIONS: Fill in all blank dimension spaces with dimension wanted. Cross out word "no" if a cylinder head stud is wanted grooved. Cross out "straight" or "taper" as wanted. Where numbered boiler tap sizes are wanted, cross out "diameter" and fill in tap number. Give threads per inch.

Machine operator will not make studs if any space is not properly filled, so that he is shown exactly what is wanted.

the boiler fit ends of the studs in step sizes of ⅛ in. each, the nominal diameters of the boiler threads are kept in even sixteenths. This practice tends to avoid confusion when a change from the regular one-eighth variations, common to locomotive studs, must be made on account of defective boiler threads requiring retapping.

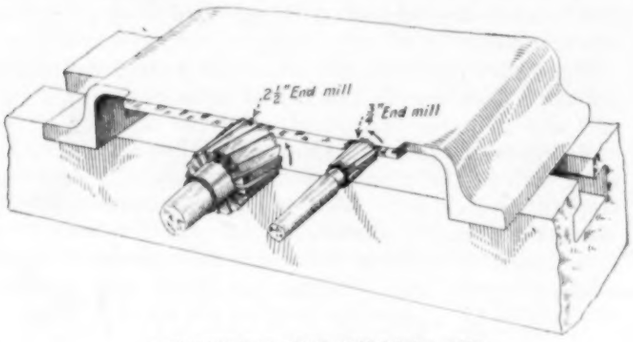
As the renewal of studs in a locomotive receiving classified or general repairs may involve the use of studs having varying lengths of the same diameter, some with enlarged boiler threads, some with standard threads on either end, and others grooved for front cylinder head fastenings, an order blank or form similar to that shown in the accompanying illustration will be found useful. The blank spaces should all be filled in to furnish the machine operator with sufficient information to make what is wanted. It also sets aside the time-worn practice of placing the blame for all errors upon the machine hand by putting the responsibility for mistakes where it actually belongs.

The practice of "grooving" or "nicking" front cylinder head studs provides a means of protecting cylinder ends when front heads are forced loose from cylinders. Large locomotives equipped with steel cylinder heads require careful attention in this respect.

A Troublesome Milling Job

By J. C. Adams

The sketch herewith shows a job of milling which used to give me a great deal of trouble. The piece was cast iron and the thickness about $\frac{7}{16}$ in., never more than $\frac{1}{2}$ in. It was very springy and, no matter how many supports I put under it, it would chatter and



A TROUBLESOME MILLING JOB

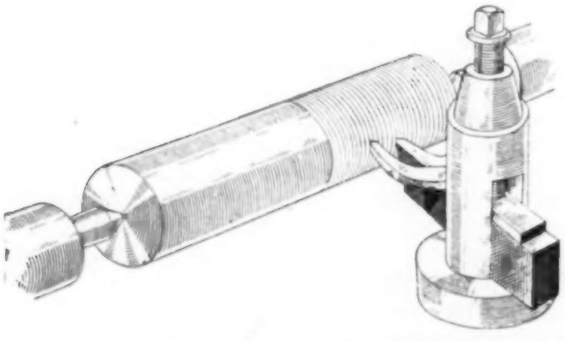
make a fearful noise. Of course, the finish was rough and even two cuts would not make it really smooth.

The other day I had an idea. I overhung the piece so that I could use a larger cutter. I had been using a ¾-in. end mill, and now I used a 2½-in. shell end mill. I placed it so that the upper part of the mill did all the cutting. The result was surprising. The cut was taken without any chatter at all. The reason is simple and I don't understand now why I did not think of it sooner. With the small cutter, placed as it was, the pressure was downward and the piece was bent and would move up and down. With the large cutter, the pressure was horizontal, or nearly so, and there was no spring or bending. Of course with the larger cutter I had to slow down the spindle speed, but just the same the piece was milled quicker because I could use a much heavier feed, had to take one cut only, and did not need to fuss away a lot of time fitting pieces of wood and wedges under the work.

Another Way to Catch the Thread

By H. O. Turnbull

I read with interest the scheme for "catching" the thread by the "jump" method, published on page 970, Vol. 56, of *American Machinist*, and I am submitting



POINTER THAT INDICATES THE POSITION OF THE THREAD TOOL

herewith the method I use for the same purpose when there is no backing belt or thread dial on the lathe.

From a piece of sheet iron about ⅛ in. thick I cut a pointer as shown in the sketch. This pointer I hold in the toolpost by catching the shank on top of the thread tool and under the toolpost screw, making sure that the point measures just 1 in. in advance of the point of the tool and enough higher so as not to interfere with the work.

This scheme has an advantage over the method mentioned in the previous article for the reason that it enables the operator to know positively whether or not the tool point is going to follow the previously cut thread; for when the carriage is run back for the new cut it is run far enough to bring the pointer over the end of the work before the nut is locked in. If, when the nut is closed, the pointer is not exactly over a previously cut thread the operator knows that the tool is not going to follow, and there is ample time to unlock the nut and make a resetting before the tool gets far enough along to spoil the work.

Single Key for Two Slot Widths

By Stephen McEvoy

In a recent issue of *American Machinist* Frank C. Hudson showed a design of key for fixtures to accommodate the varying width of T-slots in milling machine

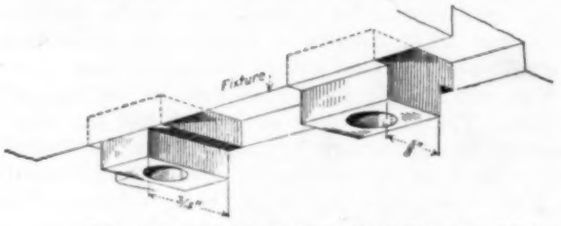


FIG. 1—A DOUBLE PURPOSE T-SLOT KEY

and other tables. The method shown, however, requires a separate key for each slot.

The key illustrated herewith is simpler and requires but one key for two sizes of slots. We take a piece of cold-rolled steel ¾ in. square by ½ in. thick. Two sides

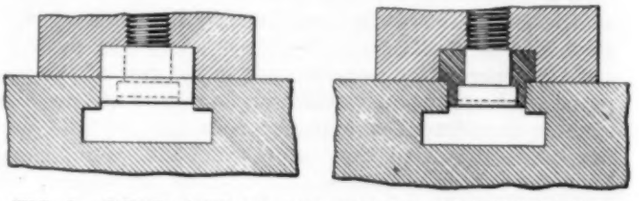


FIG. 2—(LEFT) KEY IN ¾-IN. T-SLOT. (RIGHT) KEY IN ⅝-IN. T-SLOT

are milled so as to leave ⅝ in. width for half the depth, or ¼ in. This block can now be used with the narrow or ⅝-in. side parallel with the slot, and it fits a ⅝-in. T-slot. Or, it can be turned 90 deg. so that the full width fits into a ¾-in. slot. The general appearance is shown in Fig. 1, while Fig. 2 gives more details.

Bi-chromate of Potash as a Quenching Medium

By John Livie

In hardening some shell reamers we experienced trouble from checking in the quenching bath. On advice, we made up a bath consisting of 1 lb. of potassium bi-chromate to about 40 gal. of water, which stopped all the trouble at once. Can any of the readers tell me in what way the chemical affected the steel?

EDITORIALS

Holding Up the Machine Tool Builder

WE LIKE to think that business ethics has improved greatly during the past decade, but once in a while we get a jar that makes us wonder how far some managers of big corporations have advanced beyond the cave-man type. The chief engineer of a big corporation enlisted the aid of a well-known machine-tool builder to improve his product and reduce his cost.

The agreement was that a new machine should be designed and that if it worked satisfactorily a dozen machines should be ordered at a price which would cover the cost of designing and development. Further machines would also be required, about a hundred in number, and these were to be supplied at a lower price. A perfectly straightforward agreement, made in the presence of four or five people.

The machine-tool builder went to work and built a machine which more than met all requirements. The company's own engineers pronounced it O.K. in every way and the way seemed open for completing the order for the entire lot. In the meantime, however, the chief engineer who ordered the machines resigned and the manager of the company refused to carry out the agreement. He offered to buy the first machine and perhaps a few more, at the minimum price agreed upon for the hundred. This price, it will be remembered, did not include development costs which had been taken care of in the previous order for twelve.

Fortunately for the machine-tool industry, this particular builder had two very important qualifications, a backbone and a bank account—and he promptly told the alleged big business man where to head in. Fortunately again, the machine can be utilized for other classes of work and if the company which ordered it ever get any the full price will be paid.

There are too many cases of this kind where the machine-tool builder has been made to stand the cost of developing new machines for the builders of various machinery. Customers who demand unfair advantages like these are undesirable in every way and the machine-tool builder who can and will refuse to concede to unjust demands is doing a great work for the industry. When concerns with a reputation for unfair dealings find it difficult to secure machine tools they may realize that it pays to play the business game on the level.

What's the Matter With the Machine Tool Business?

THE employment manager of a good sized machine tool shop came into the office of the works manager the other day and said, "What's the matter with the machine tool business anyhow? Here is a list of about twenty good men who have quit us within a month, in the face of improved business too, to go into something else that pays better wages or offers more opportunities.

"Funny part is only a few are going to other mechanical lines. The automobile shops used to take even our poor men and pay 'em double what we could. But these men are going into laundries, grocery stores, insurance business and all sorts of work that ought not to pay nearly as well as working right here in our shop. A good mechanic has to have more real knowledge and training than any kind of worker I know, a lot more than those in any of the lines I have here on my list.

"Some, of course, are making a mistake and will come back to this or some other shop later. But the majority of them will make good and wish they had gone before. And it isn't saying much for the machine tool business either."

The employment manager was right. Machine tools are the foundation of every industry using machines of any kind. For the sake of the future of the country itself the machine tool industry should have the best workmen and the best designers in the land. To do this it must be the most attractive industry to the right kind of men, both as to working conditions and remuneration.

The automobile and other industries have pointed out the way, yet unfortunately, the very industries which have been made possible by machine tool development, are too often unwilling to pay a fair price for the machines they buy. The cost of developing these machines does not secure proper consideration. In one particular instance the builder of a machine lost several thousand dollars in this way while the purchaser saved enough in three months to cover its cost to him.

Neither exorbitant prices nor excessive profits have any place in any industry. But the users of machines should realize that the industry on which our future development depends should have more consideration than has been the case in too many instances. Not so much for the machine tool industry itself as for those industries which are dependent on it, and for the country as a whole.

Just Suppose

JUST suppose all union labor should adopt a new way of paying their leaders, giving them an increase of salary when their men had obtained higher wages, a reduction when the wages of the men had been reduced and no salary at all when there is a strike, how many strikes would there be in ten centuries? Think of the amount of real hard work the leaders would do to get their men a raise. Think of the desperate efforts they would make to prevent a cut. But not by striking. Heaven forbid. Think of all the tricks the leaders would learn to accomplish their object, whereas now they know only one. Maybe they know more, but anyhow they *use* only one. Think how everyone would work up, and perfect and polish up his own union, so as to get a higher price for his ware. Think of all the union leaders' weeklies, monthlies and quarterlies to spread and promote scientific union management.

But no, this will never happen, it is not practical. We should not expect the union leader to introduce such revolutionary methods, and if they don't, who will? The men? What have they to say about such matters?

No, this will never come to pass, but—

Just suppose.

Shop Equipment News

Landis Heavy-Duty Roll Grinding Machine

A large heavy-duty cylindrical grinding machine for finishing all types of hot and cold mill rolls is now being marketed by the Landis Tool Co., Waynesboro, Pa. The accompanying illustrations show one of these machines finishing a 16,000-lb. roll in the plant of the Aluminum Company of America, Marysville, Tenn.

The machine is entirely self-contained and is driven by three separate motors. One motor, shown in Fig. 1, drives the work and is mounted on the bed of the machine and directly connected to the headstock; one is mounted on a carriage traveling on a track at the back of the machine for driving the grinding wheel, as shown in Fig. 2, and a small motor is directly connected to the water pump. All the motors are controlled by means of push buttons on the operator's platform.

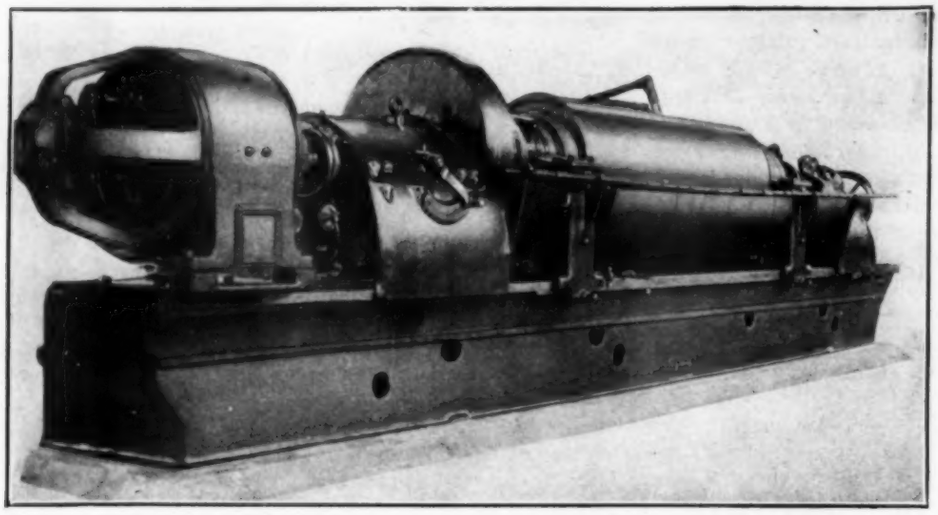


FIG. 1—LANDIS HEAVY-DUTY ROLL GRINDING MACHINE

The operator's platform is mounted on the grinding wheel carriage so that the operator has a clear view of the wheel and the work at the point of contact, which view cannot be obtained if the machine is operated from the front. The carriage traverse and reversing mechanism are all contained in one unit mounted on the grinding wheel carriage within easy reach from the operator's platform. All gears are made of chrome-nickel steel and run in a bath of oil. The main drive on the grinding wheel carriage is through a worm and rack which gives smooth operation, while provision has been made for a tarry at the point of reversal. Provision is also made for a power movement of the grinding wheel base for moving the wheel rapidly toward and away from the work.

A special feature embodied in the machine is an attachment for grinding the periphery of the roll either concave, convex or straight, as desired. The amount of crown or concavity is varied by a simple system of gearing at the back of the machine. The gearing can be engaged and disengaged by means of a lever on the operator's platform.

The roll supports furnished with the machine are of the two-bearing type, which permits grinding the journal without changing the position of the roll, so as to get the body of the roll and the journal concentric. The bearing blocks are adjustable in the roll supports so as to accommodate journals of different diameters without need of different bearings.

It is stated that under actual operating conditions the machine has removed as much as 7 cu.in. of chilled iron per minute, and the accuracy and sensitiveness have been maintained throughout the work. The machine is built in standard 20-, 30- and 40-in. sizes in any required length. Its construction adapts it to surfacing all sorts of large rolls of the type just described.

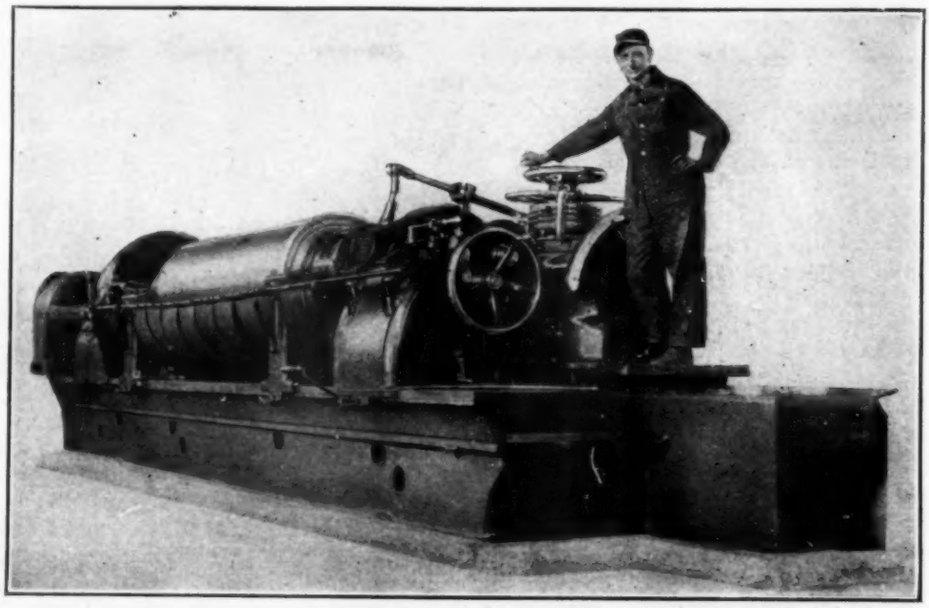


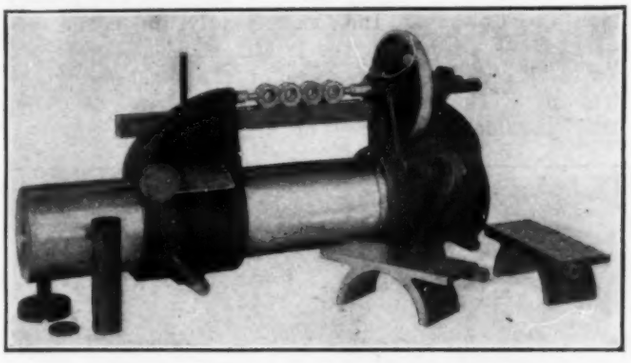
FIG. 2—OPERATING CARRIAGE ON LANDIS ROLL GRINDING MACHINE

Pratt & Whitney "Super-Micrometer"

The super-micrometer brought out by the Pratt & Whitney Co., Hartford, Conn., is really a bench measuring machine. It has capacity up to 8 in. in diameter, though its direct measuring capacity is only 0.500 inch.

It consists of two measuring heads, one with a stationary spindle and anvil, the other with a spindle which can be moved in and out by means of a large graduated wheel. The amount of spindle movement is 0.500 inch.

The wheel is not moved by hand but by a very small round belt which is engaged by the knurled knob shown. This knob has a smaller knob attached to it, which permits spinning it with the fingers so as to obtain rapid adjustment of the spindle. The final adjustment is made by turning the large knob very slowly. The belt is for the purpose of measuring always with the same amount



"SUPER-MICROMETER" MEASURING MACHINE

of pressure, by continuing the rotation of the knob until the belt slips. That the belt may be tighter at one time than at another has no effect on the accuracy because the machine is set up under the same conditions under which the measuring is done.

This setting up is accomplished by the standard inch blocks, which are machine-lapped by modification of the Hoke method and are accurate within five millionths of an inch. These blocks should be kept in a casing or pocket at the rear of the headstock provided for that purpose. As many inch blocks as required, but not more than eight, are set side by side on a bar which is slightly channeled out for convenience in holding them and which rests between a slot in the tailstock and a pin at the front of the headstock. This arrangement insures that the blocks will lie with their horizontal diameters in line with the centers of the spindles.

When the tailstock is brought up against the blocks it is clamped on the cylindrical bed of the machine, after which an arm, called the "zero arm," is swung around until a mark comes opposite the zero mark of the dividing wheel. If, as in the illustration, there are four inch blocks and the spindle is as far back as it will go, then it is possible to measure anything from 4 in. down to 3½ in. With the spindle entirely forward, it is possible to measure from 4 in. up to 4½ inches.

The marks on the spindle are 0.050 in. apart and the figures are given by 0.100 in. There are 500 divisions on the dividing wheel, of which every tenth is provided with a figure. These divisions are $\frac{1}{32}$ in. apart and each one denotes 0.0001 in., so that the figures read direct in thousandths.

The channeled bar may be reversed for supporting flat work and in addition two tables are furnished which can be laid on the bed to support larger work.

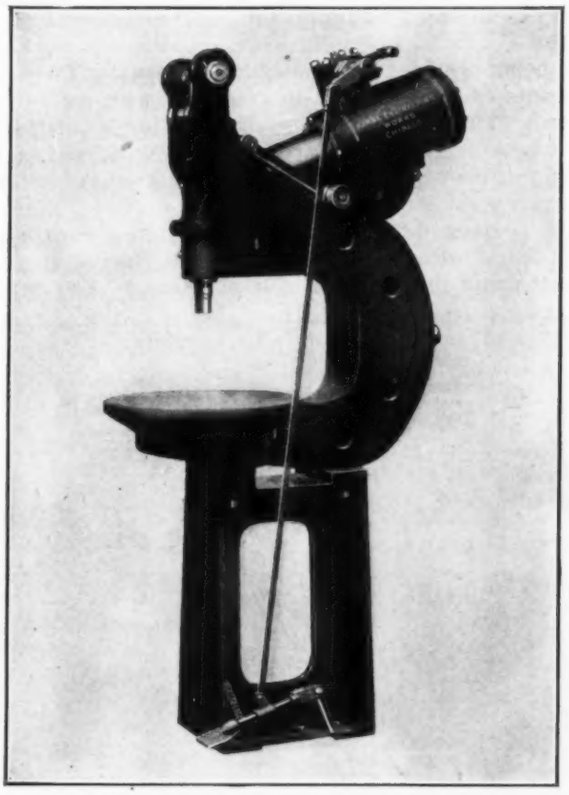
Hanna Pneumatic Toggle and Lever Press

A general utility press operated by means of compressed air or steam has just been placed on the market by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., the power mechanism of the machine being similar to that used on the riveters formerly made by the concern. The accompanying illustration shows the type of press employed for compressing or packing carbonizing material in pots around parts such as gears and forgings to be casehardened.

The press can be arranged with various forms of platens or work-supporting structures, so as to make it adaptable to straightening, bending, forcing, marking, embossing, coining, forging, briquetting, multiple riveting, and such operations. The machine is made in tonnages of 15, 20, 30, 50, 70, 80, 100, 125, 150 and 200. In all sizes it is portable in the sense that it can be moved without the need of moving any auxiliary equipment. The machine requires only a small floor space.

The die is mounted on an adjusting screw. The valve controlling its manipulation can be operated by either hand or foot. The length of stroke can be adjusted. The connecting mechanism between the die and its actuating piston consists of a combination of a toggle and lever. The piston imparts to the die a gradually decreasing speed and an increasing pressure for each unit of travel of the piston during the first part of its stroke. The last portion of the stroke of the ram is made at practically a uniform pressure. The first portion of the stroke, or the increasing pressure part, is from 1½ to 4⅝ in. long, depending on the rating of the machine. The last portion, where uniform pressure is held, is from ⅜ to 1⅛ in. long.

The machine is well adapted to bending and straightening operations, since the pressure on the die builds up in the same ratio as the air pressure placed on the pis-



HANNA PNEUMATIC TOGGLE AND LEVER PRESS

ton. It is possible by throttling the air to bring on the work just sufficient pressure to deflect it the desired amount, and then to rapidly release the pressure. If the die travel is stopped by the work at any point within the uniform pressure stroke, the pressure on the die is a known predetermined amount in proportion to the pressure in the air line. This line pressure can be controlled by a pressure-regulating valve to within 5 per cent.

When used for marking, embossing, coining and forging uniformity of results can be obtained, since the pressure can be adjusted and maintained for each job. The regulating valve can be set, and the manipulation of the operating valve and variation in thickness of the stock within the limits of the length of the uniform-pressure stroke, do not affect the pressure obtained on the work.

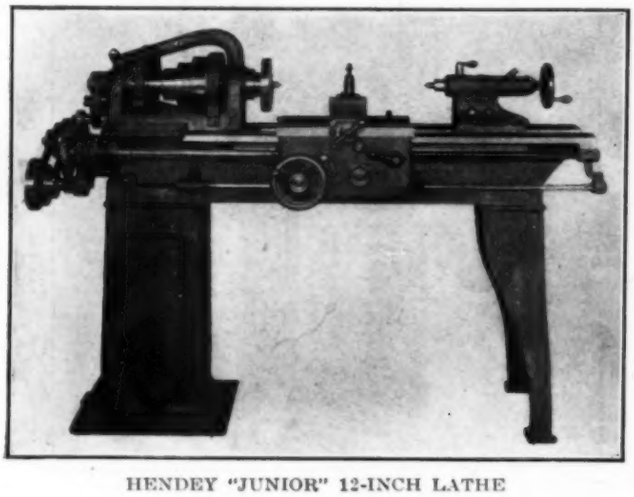
Hendey "Junior" 12-Inch Lathe

The Hendey Machine Co., Torrington, Conn., has brought out a lathe to be designated as the "Junior." The tool is intended for light manufacturing purposes, for small shops and for vocational school service, where a thoroughly practical and rugged tool is wanted, but without the full complement of attachments and features that have come to be recognized as part of a regular toolroom lathe.

This lathe is belt-driven to a four-step cone, as shown in the accompanying illustration, is provided with change gears instead of the gear-box for screw cutting, and the feed may be obtained either through the change gears or through a feed belt running over a three-step cone. The lead screw is 1 in. in diameter and has 6 threads per inch. Threads from 2 to 36 per in. may be cut. As in the regular Hendey lathe, the carriage traverse is stopped, started, or reversed by the movement of a lever on the apron.

The main spindle runs in tapered bearings, $1\frac{7}{8}$ to $2\frac{3}{8}$ in. and $1\frac{13}{16}$ to $2\frac{5}{16}$ in. in diameter, respectively, the bearings being provided with means to compensate for wear. The spindle nose is 2 in. in diameter, with an 8-pitch thread. There is a through hole $\frac{13}{16}$ in. in diameter. Quill back-gears provide a 10.4 to 1 ratio of reduction. With the two-speed countershaft furnished, 16 spindle speeds are available.

The carriage has a bearing of $16\frac{3}{8}$ in. on the shears. It is fitted with power crossfeed and compound rest. The toolpost takes 1 x $\frac{1}{2}$-in. tool shanks. The actual swing over the shears is $12\frac{3}{8}$ in., and over the carriage $7\frac{1}{4}$ in. The maximum distance between centers with the 5 ft. length of bed is $27\frac{1}{4}$ in. The lathe can be regularly furnished with 4, 5, or 6 ft. bed length, or longer upon order.



HENDEY "JUNIOR" 12-INCH LATHE

The equipment includes a two-speed countershaft, large and small faceplates, center rest and all necessary wrenches. All attachments to the standard 12-in. Hendey lathe are applicable to this one. A cabinet leg under the headstock end of the bed is fitted with shelves and partitions, providing a place to keep change gears, wrenches and accessory parts.

Changes in Reeves Centerless Grinding Machine

The centerless grinding machine made by the Reeves Pulley Co., Columbus, Ind., has recently undergone several changes in design, the latest model being shown in Fig. 1. A special feature of the machine is the "drop-in" work rest which makes it possible to grind either shouldered, tapered or straight work.

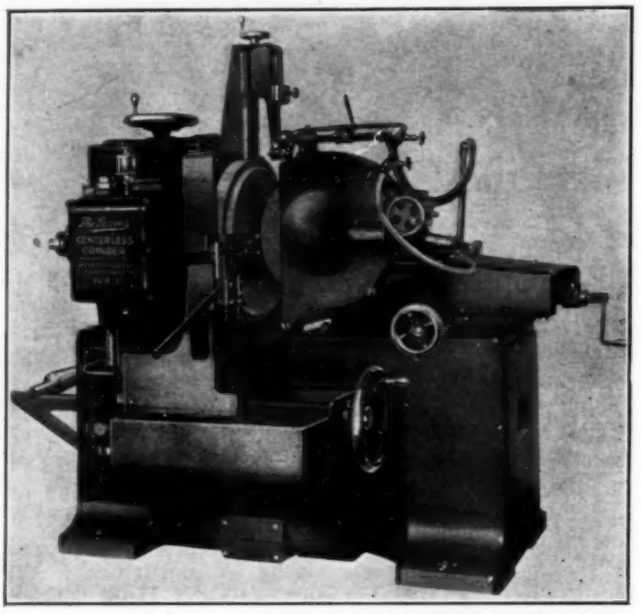


FIG. 1—REEVES CENTERLESS GRINDING MACHINE

The rest consists of a steel bar with a hardened and ground edge which supports the work in a true horizontal position between the two wheels. On top of the bar there is an extended slotted guide, leaving an opening just large enough to receive the work to be ground. On the sides of the bar are guide walls which hold the work in a straight line and exactly central between the two wheels. A stop is provided which may be adjusted for different lengths of rolls. The construction allows the rolls to extend between the wheels just far enough to grind the roll and not touch the shoulder.

The end of the guide, with a motor valve in position for having its stem ground, is shown in Fig. 2. The guide is mounted on rollers, so that it can be drawn forward, raised to permit the work to be entered lengthwise above the grinding point for a distance of 5 in. or less, and lowered to the grinding position. In this way the piece is centered and ground concentric throughout its entire length. The work rest, being mounted on rollers, can travel with the work; but the

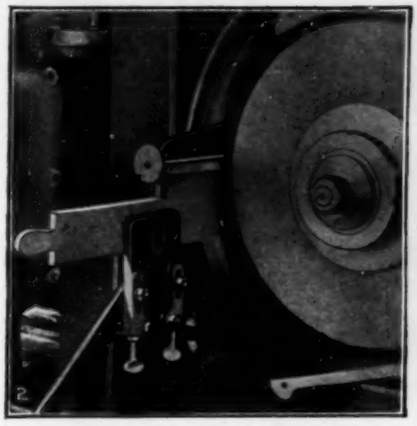


FIG. 2—GRINDING A MOTOR VALVE STEM.

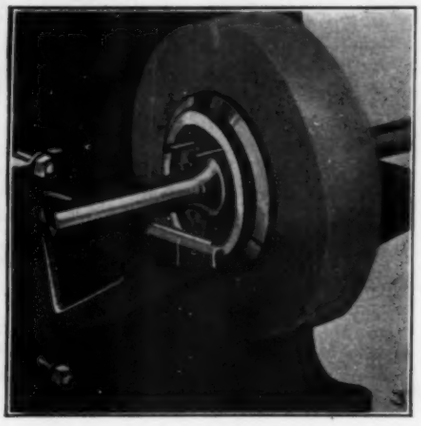


FIG. 3—BAL ANCING A WHEEL

drop-in method makes a convenient way to grind shoulder work such as valve stems and shackle bolts. Tapered work can also be ground on the drop-in work rest. The diamond dresser has an adjustment for obtaining any degree of angle desired to make the proper taper.

Another feature of the machine is the balancing ways and arbor for grinding wheels. It is essential that the wheel be in fairly accurate balance, so an easy method of balancing is provided. Holes are drilled in the chuck just within the bore of the wheel. Balancing pins are furnished which may be placed in the holes just opposite the heavy spot, so as to secure an accurate balance of the wheel. Permanent balancing ways are a part of the regular equipment, and are bolted to the base of the machine. Fig. 3 shows both the pins and the ways. A tapered arbor which fits the chuck is also furnished for use when balancing the wheel.

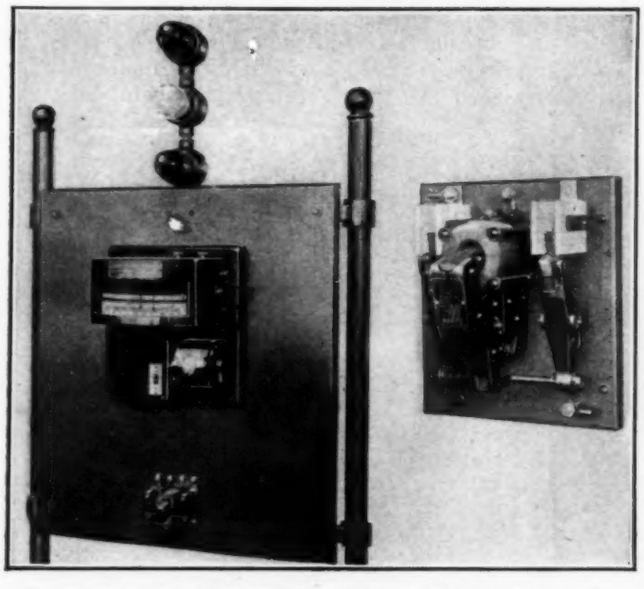
Hoskins Automatic Temperature Regulator

An apparatus for controlling the temperature of electric, oil or gas furnaces automatically has recently been placed on the market by the Hoskins Manufacturing Co., Lawton Ave. at Buchanan, Detroit, Mich. The temperature of the furnace can be held within limits of plus or minus 10 deg. F. The control mechanism automatically operates every 30 sec. to test the temperature.

The regulator can be most easily adapted to use on electric furnaces, as the instrument operates a small relay that, in turn, actuates the main power switch, which is of the magnetic type. The complete equipment for use with an electric furnace is shown in the accompanying illustration. Signal lamps and fixtures, a relay, the magnetic control switch and the instrument itself can be provided mounted on a slate panel. The control switch is shown more clearly in the small view at the right of the illustration.

When the furnace is operating within 8 deg. F. of the desired temperature, a white signal light is lighted at the top of the board. If the temperature goes below this limit, a green light appears, while if it goes above, a red one is lighted. The mechanism operates the control switch, so that the error is corrected before it has deviated more than 10 deg. from the desired temperature. Thus the control is positive and automatic.

The control mechanism of the regulator is operated by a small motor, which can be supplied for use on either a.c. or d.c. lines of 110 to 220 volts. The case of the instrument is made of cast iron and has a black enamel finish. Its over-all size is 12x10½x8¾ in., and its net weight 27 pounds.



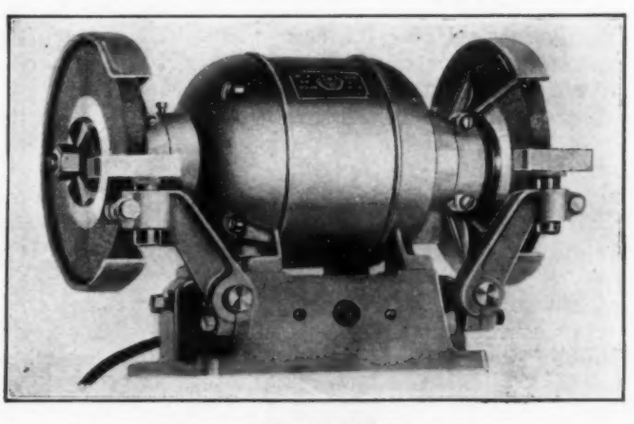
HOSKINS AUTOMATIC TEMPERATURE REGULATOR

Black & Decker 8-Inch Electric Grinder

A small electric bench grinder carrying wheels 8 in. in diameter and ¾ in. wide, and driven by a ½-hp. motor, has recently been placed on the market by the Black & Decker Manufacturing Co., Towson Heights, Baltimore, Md. The motor is not of the universal type, but is intended for operation on either direct current or alternating current of 40 or 60 cycles. It can be furnished for voltages of either 110 or 220.

Large bearings carry the combined motor shaft and spindle. The no-load speed is 3,600 r.p.m. The machine is furnished complete with two abrasive wheels, two wheel guards, two adjustable tool rests, a toggle switch in the base, and 5 ft. of electric cable fitted with an attachment plug.

The accompanying illustration shows the grinder arranged for mounting on a bench, although a pedestal can be furnished so that it may be stood on the floor. The net weight of the bench grinder is 75 pounds.

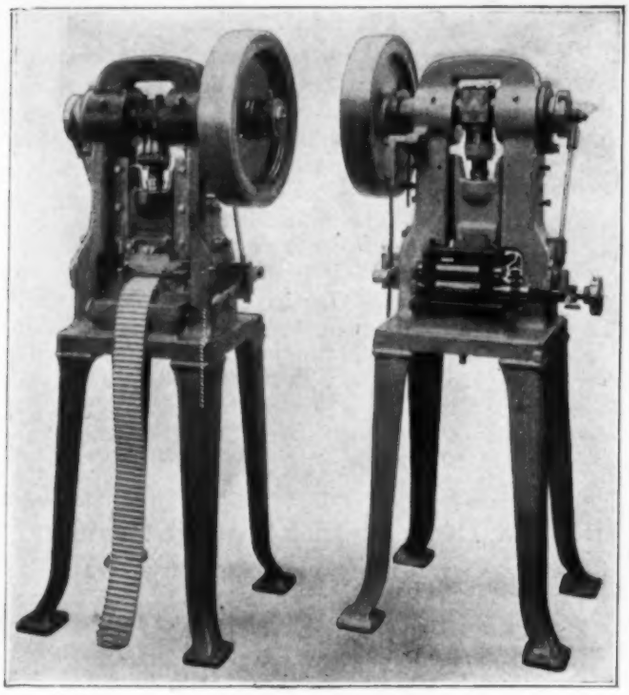


BLACK & DECKER 8-IN. ELECTRIC GRINDER

Dover Pillar Punch Press

The accompanying illustration shows front and rear views of a small pillar punch press made by Geo. W. Dover, Inc., Providence, R. I. The press was developed primarily for work on radiator cells, a strip of which can be seen in the view at the left of the illustration, although it is adapted to any sort of sheet-metal work within its capacity. If desired, it may be equipped with a roll feed.

The stroke of the ram is 1¼ in., and the vertical adjustment is 2 in. The maximum distance from the ram to the bed of the press is 5 in., the dimensions of



DOVER PILLAR PUNCH PRESS

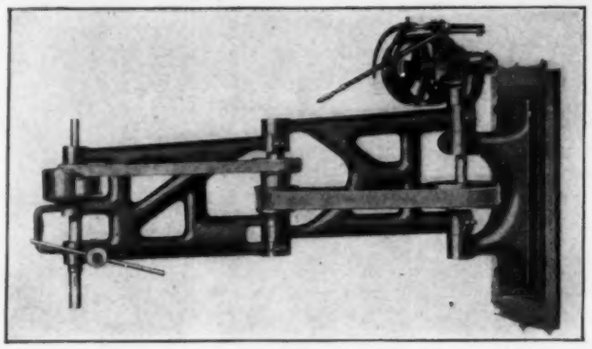
the bed being 9½x11 in. The machine is driven by means of a 3-in. belt on a flywheel 18 in. in diameter and having a solid web. With the legs it weighs 700 lb. The floor space required is about 36x40 inches.

Hammond Wall Bracket Drill

A light swinging drill for attachment to a wall or post, and that reaches any point within a radius of 3½ ft. of its fastening, has recently been placed on the market by the Hammond Manufacturing Co., 6545 Carnegie Ave., Cleveland, Ohio. The machine has a capacity in steel of ⅜ in., and is especially adapted to work on parts for electrical instruments, switchboards and stoves.

The drill is belt-driven through tight and loose pulleys 8 in. in diameter and carrying a 2-in. belt. The countershaft is geared to the upright shaft, from which two belts carry the drive to the spindle. The countershaft yoke can be set to any position to conform to the overhead drive. It is provided with a belt-shifting lever.

The two arms swing on stationary sleeves, so that the pressure does not come directly on the driving shafts. The spindle is equipped with ball thrust bearings, and has a No. 2 Morse taper hole and a traverse of 2½ in. The spindle quill is of steel with bushed bearings and the rack cut from the solid. A spring counterbalance is provided.



HAMMOND WALL BRACKET DRILL

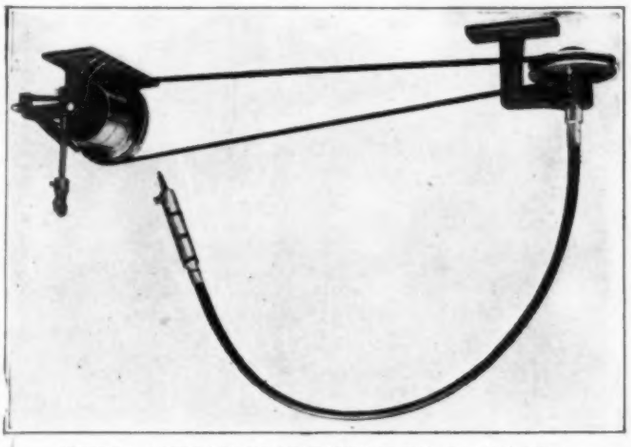
The tight pulley ordinarily runs at 400 r.p.m., and two speeds of the spindle of 500 and 1,300 r.p.m. are provided. The spindle pulley is covered with a belt guard. The shipping weight is 250 pounds.

Hergi Type NK4S Flexible-Shaft Outfit

The flexible-shaft outfit shown in the accompanying illustration is a recent product of the Hergi Manufacturing Co., 250 Fifth St., Bridgeport, Conn. The outfit is intended primarily for driving screws, as in the manufacture of radio equipment. It is arranged primarily for over-head mounting, but can be secured to either the bench, wall or ceiling. When the screwdriver is employed in the vertical position, the bracket is ordinarily mounted on the ceiling; but for horizontal work, it can best be mounted on the wall. In this way, the flexible shaft can be kept quite straight while the work is in process.

The counter-shaft is equipped with tight and loose pulleys and with a lever-operated belt shifter for moving the belt from one pulley to the other. A round leather belt transmits the power to the bracket carrying the flexible shaft. For speeds from 150 to 750 r.p.m. the swivel connection where the shaft joins the bracket is equipped with plain hardened and ground steel bearings. For high speeds, however, in conjunction with the ball-bearing hand piece such as used for grinding purposes, a ball-bearing swivel connection can be furnished.

The style of flexible shaft and hand piece needed to suit the work can be provided. The finder sleeve can be furnished to fit the screw that is being driven.



HERGI OVER-HEAD FLEXIBLE-SHAFT OUTFIT

News Section

Steel Treating Society Elects Officers

At the recent election of the American Society for Steel Treating, the following officers were elected for the ensuing year: President, T. D. Lynch, research engineer, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.; second vice-president, W. S. Bidle, president, W. S. Bidle Co., Cleveland, Ohio; secretary, W. H. Eisenman, 4600 Prospect Avenue, Cleveland, Ohio; director, S. M. Havens, assistant treasurer and manager, Ingalls-Shepard Division, Wyman Gordon Co., Harvey, Ill.

The board of directors of the society will be composed of the newly elected officers and the following: First vice-president, R. J. Allen, metallurgist, Rolls Royce Co. of America, Springfield, Mass.; treasurer, J. V. Emmons, metallurgist, Cleveland Twist Drill Co., Cleveland, Ohio; director, J. J. Crowe, metallurgist, Philadelphia Navy Yard, Philadelphia, Pa.; director, A. E. White, past-president, director engineering research, University of Michigan, Ann Arbor, Mich.; director, F. P. Gilligan, past-president, secretary-treasurer, Henry Souther Engineering Co., Hartford, Conn.

The new officers will begin their duties at the close of the annual convention of the society, which will be held at Detroit Oct. 2 to 7 at the same time as the International Steel Exposition.

Calvin W. Rice Goes to Rio Exposition

Appointment of Calvin W. Rice, secretary of the American Society of Mechanical Engineers, as official delegate to the Engineering Congress to be held in connection with the International Exposition at Rio de Janeiro, has been announced at the national headquarters of the society in New York City.

Mr. Rice, who goes as the emissary of organized engineering in the United States, and who for purposes of representation at the Congress has been elected an honorary vice-president of the Society, will sail from New York Aug. 23 on the steamship Pan-America, which will convey Secretary of State Charles E. Hughes and his party to the Brazilian capitol.

Mr. Rice's journey was called by officials of the Society the opening of a new chapter in international relations among engineers. For many years, it was stated, this Society has been active in laying the groundwork of a close union of thought and effort among the engineers of the world as a part of an elaborate plan of public service which is being gradually linked to the technical activity of the Society, and which, through a national network of local sections, professional divisions and administrative committees, is enlisting the co-operation of nearly 200,000 members in every State. From the Rio Congress engineers look for results which will give to Pan-American ideals new meaning and vitality. The work of this Congress, it was said, is another phase of the world-wide engineering movement sponsored in London by Sir Robert Hadfield, in Paris by Eugene Schneider, head of the famous Creusot works, and in Italy, Czechoslovakia and other European nations by leading engineers and government officials.

Machine Tool Exhibit in New Haven

Under the combined auspices of Yale University and the Connecticut section of the American Society of Mechanical Engineers, a machine tool exhibition will be held in the Mason Laboratory of the university, New Haven, Conn., Sept. 21, 22 and 23.

Several exhibitions of machine tools have been held in various parts of the country in the past few years but there has been no concentrated effort to bring them to the attention of the general public as is being done in this case. Yale University appreciates the courtesies extended its students interested in mechanical engineering by the manufacturing plants of Connecticut and New England and has generously offered the use of the Mason Laboratory for the exhibit. This offer by Yale made it possible for the Engineering Society to carry out a long felt wish and the exhibit should prove of interest not only to the shop superintendent, purchasing agent, master mechanic, but to the general public.

Students of Sheffield Scientific School get considerable practical experience on machines and tools on their tours of nearby manufacturing plants, and many makers of machines and machine tools in order to facilitate the work being done by Yale send demonstrators from time to time to explain the workings of their instruments, etc., and out of those demonstrations came the idea of the exhibit.

Mason Laboratory has unusual facilities for the handling of such an exhibition as this, in fact it seems to have been erected for just this purpose. It has a ten-ton crane and a number of smaller ones to move machines to their proper places, lecture rooms equipped with motion picture apparatus, wide hallways and plenty of floor space. There will be no cost to the manufacturer to show his goods and there will be no admission charged to those who wish to view the display. An opportunity to display small machinery and tools will also be afforded.

Kenneth F. Lees, 9 Hillhouse Ave., New Haven, Conn., is chairman of the executive committee which is responsible for the exhibit which is being held in connection with the Fall meeting of the Connecticut section of the American Society of Mechanical Engineers. No meetings are held in the Summer and through the exhibition it is expected that this meeting will be more on the order of a convention.

Greenville to Get New Steel Plant

A steel plant complete in all departments, costing $2,500,000 to erect and equip, to be known as the Greenville Steel and Iron Co., is to be built at Greenville, Pa., and put in operation next spring for the manufacture of alloy steels.

The backers of the new company propose building one 500-ton blast furnace, four 60-ton open hearths and one 10-ton open hearth for experimental and analytical work, a steel foundry, four rolling mills and a cold drawing mill. The proposed output is to be 165,000 tons of steel, 182,000 tons of pig iron, of which the plant expects to use 110,000 tons, the balance to be disposed of to other mills, and 12,000 tons of electrical steel castings. The rolls will be electrically operated and the backers expect to build their own power plant with a capacity of 15,000 hp.

The officers of the new company will be Colonel H. P. Bope, for many years connected with the Carnegie Steel Co., president; H. B. McConnell, formerly consulting engineer with the Carnegie Steel Co., managing director, and A. H. Davies, one of the best known open hearth men in the country, general superintendent.

The plant will be located south of Greenville, where 35 acres of land have been secured with direct rail connections with the Bessemer, Pennsylvania and Erie Railroads. General sales and executive offices are to be located in Greenville.

International Chamber of Commerce to Meet in Rome

Announcements have just been sent out for the second general meeting of the International Chamber of Commerce which will be held in Rome, Italy, March 18-24, inclusive, 1923.

The present indications are that there will be from two to three hundred American business men in attendance at this meeting. Already a number of prominent business men have made reservations on the S.S. Caronia, which has been chartered for the trip, among them being the following:

A. C. Bedford, chairman of the board, Standard Oil Co. of New Jersey; Julius H. Barnes, president, Barnes-Ames Co., New York; John H. Fahey, Boston, Mass., director, International Chamber of Commerce; Joseph H. Defrees, Defrees, Buckingham, and Eaton, Chicago; William Butterworth, president, Deere and Co., Moline, Ill.; Harry A. Wheeler, vice-president, Union Trust Co., Chicago; Lewis E. Pierson, chairman of the board, Irving National Bank, New York; Edward N. Hurley, Hurley Machine Co., Chicago; R. P. Lamont, president, American Steel Foundries, Chicago; Clarence H. Howard, president, Commonwealth Steel Co., St. Louis.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York
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SAN FRANCISCO, CAL., Aug. 27.

DURING the last ten days I have visited Spokane, Seattle, Tacoma, Portland and San Francisco. They are the five principal cities of the Pacific Northwest. They serve and are dependent upon a region that is in an economic sense almost self-contained, for it produces nearly everything that civilization requires except cotton and silk, and it can get cotton from Arizona and silk from Japan very quickly when either of them is needed. The coal strike has no terrors for the people in this section, for the fuel is chiefly oil and wood, though coal can be had from the Washington mines when needed. And the roads are so good that even if the railways stopped running it is probable that the many automobiles with which the country is supplied could furnish all the local transportation needed.

Therefore the community is not much concerned about the labor troubles that are vexing the East and Central West. The crops are generally good. They are bringing fair prices. The low rates at which the intercoastal and foreign traffic is carried by water through the Panama Canal gives the farmers and lumbermen of the Pacific slope a tremendous advantage over their Eastern competitors and in the event of a general tie up of the railroads it might be that many cities on the Atlantic seaboard would be fed with food brought from California, Oregon and Washington.

The feeling is therefore one of complacent optimism and confidence in the future. Credit is abundant, money is easily obtainable. There is little or no unemployment and the working men with whom I have talked seem satisfied with the wages paid them.

Among business men there is as elsewhere great complaint over the high taxes that they have to pay and it is therefore easy for the politicians who promise relief to get a hearing. The political pot is in fact boiling quite furiously. It seems quite probable that at the primary election shortly to be held some entirely new and rather radical candidates will be nominated but this corner of the United States has been for a long time the political laboratory of the nation and no one seems very much afraid of the experiments in government that are from time to time tried out here. Among the more far sighted business men there is perhaps some apprehension lest the pending tariff bill may adversely affect the foreign trade of the Pacific Coast, which is increasing rapidly, but only those who take a long distance view are as yet much concerned over this aspect of the situation and it is undeniably true that the high duty on wool which has evoked so much protest elsewhere is generally approved of in this section and especially in Idaho, Montana and Washington.

The announcement by the United States Steel Corporation of a 20 per cent increase in the wages of its day labor, supplemented in the press by reports of labor scarcity and higher wages elsewhere, was easily the most important event of the week. It served rather sensational notice on the rest of the country that the era of declining wages was definitely at a halt and that probably they would follow other barometric indicators upward. Bond prices reached their bottom about the middle of 1920, stock prices in August, 1921, commodity prices, production and trade about the same time or a little later, and commercial loans and money rates about last June.

Bonds have since recovered so far that there is some justification for thinking that their next peak is not many months ahead. Stocks have climbed about 30 per cent. Commodity prices are perhaps 10 per cent higher and the volume of trade has increased even more. As for industrial production, July figures compared with a year ago showed a gain of 177 per cent in pig iron output, 59 per cent in automobiles and 89 per cent in accessories and parts, 78 per cent in sugar meltings, 20 per cent in electric power production, 61 per cent in building contracts, 9 per cent in gasoline consumption, and 12 per cent in cotton consumption. Bank clearings for July were 15 per cent above last year, and the number of workers employed increased about the same.

The greater volume of business, however, has not brought satisfactory profits to many manufacturers, and their insistence that wages must still come down has partially obscured the fact that wages are subject to the same economic influences as bonds and stocks and that there is a market for labor as well as for commodities, a market which is bound to go up when demand begins to exceed supply. These are facts, whether we think higher wages are economically desirable at present or not. Most of us think not, but sellers who want higher prices must also expect to pay them for labor. The Steel Corporation's recognition of this fact is courageous, and it is the most convincing expression of confidence in the permanence of better business that could be given. I say "better business" because that is what it will seem like for some time to come. The far sighted will realize that rising wages are an important indication of the secondary inflation for which many economists have been looking, and that eventually bond prices will stop rising, commercial loans will increase, interest rates will go up and stocks will decline, and that later there will be a contraction of business and decline in prices again. But these developments are unquestionably far in the future and while the Federal Reserve ratio remains around 80 per cent we can be assured that many months of better business are still ahead.

Most of the other developments of the week were of transient importance. On the financial side the abundance of the country's credit resources for moving the crops without recurrence of the strain of former years, and for facing the transportation congestion which appears certain, is testified to by the huge amounts which banks all over the country have invested in securities. The Federal Reserve ratio, as a result of a small decrease in gold holdings and increase in deposit liabilities, showed an unimportant decline to 79.8 per cent. The best opinion still inclines to the belief that interest rates are at bottom, and it is reported that Secretary Mellon, a shrewd judge of the money market, will soon offer a large long term bond issue to retire the Victory 4¾ per cent notes which are callable on Dec. 15.

The terms adopted at Cleveland for settling the coal strike have been accepted by many other operators and it seems probable that production during the fall will be much heavier than anyone dared predict two weeks ago. When they are recognized, emergencies often disappear thus quickly. With the railroad strike little progress is reported. Most of the executives and shopmen are as far from a compromise on the seniority question as they were a month ago. A minority, however, are reported to be negotiating an agreement and if they do come to terms the settlement will probably spread as it has in the case of coal. Meanwhile each day's deterioriation of equipment will accentuate the impossibility of moving the huge amounts of freight which will be offered as coal mines resume operation.

The German mark declined again last week until a thousand in New York cost only 52 cents. The catastrophe thus accentuated is unchanged in any important respect from last week, and until constructive action is taken by the Allies there is little more to be said of it. It is a relief to look at two of our largest customers nearer home. The Canadian dollar is at par and the outlook in Cuba is reported much more promising. Even China is winding up her civil conflict and seems likely to come out of it a stronger and more unified nation. She is the greatest potential market on the globe. Conditions in Japan show continued improvement with a favorable trade balance for July indicated.

Business in the United States has given astonishing evidence of its recuperative power in the past year, and all the indications are still tending upward. When one of them reverses itself it will be time to point out the necessity for caution. Until then we can view the future with assurance of an autumn of continuously expanding trade and a winter of prosperity.

Foreign and Domestic Trade Conditions

THE outstanding event in the news of the week, and overshadowing in its importance to American trade the discouraging failure to effect peace in the railway strike in the United States, is the failure of the Bradbury mission to Berlin with the subsequent collapse of the German mark. Normally worth 23.8 cents, it has dropped to a point where 100 marks are now worth 5¼ cents, to a point where 10,000 marks are needed to buy one pound sterling. Reports indicate that France has refused absolutely to consider the proposed plan for a five months moratorium and that she will insist on some sort of physical control over German industrial enterprises. In taking this step she is further jeopardizing her already precarious position. The complete collapse of Germany means the collapse of France also and with her Italy. And the effect such a situation would produce upon American trade is well worth sober thought. Already signs are not wanting of a falling off in demand from the European nations for our foodstuffs and raw materials—materials which they must have before they can revive their former productive industries and produce a surplus for export.

French foreign trade, according to reports just made public, continues to show an upward mounting of her adverse balance. Statistics compiled for the first seven months of the current year show total imports valued at 12,667,000,000 francs and exports valued at 10,802,000,000 francs. In other words, an unfavorable balance of 1,865,000,000 francs is indicated for the seven months period. This compares with an unfavorable balance in the corresponding period of 1921 of 588,000,000 francs. The figures for July show increasing excess of imports over exports, importations totaling 1,996,000,000 francs as against exports totaling 1,433,000,000 francs, or an unfavorable balance of over 500 million francs in July alone. These figures seem to indicate quite clearly that the frequent reports to the effect that France is rapidly recovering her favorable economic position are completely unfounded. France now has a national debt greater than any other European country, excepting Germany. It is rapidly approaching a point where it will be twice as great as that of Great Britain. France did not come anywhere near making both ends meet in 1921 and her plight for 1922 is even less promising.

Japan's foreign trade, after showing an unfavorable balance for twenty consecutive months, since October 1920, shows an excess of exports over imports for the month of July, according to preliminary figures furnished by the Department of Commerce. Exports totaled 144,800,000 yen as against imports of 142,200,000 yen, resulting in a small but favorable balance of 2,600,000 yen. This is an encouraging sign. Japan has just passed through a financial crisis. She is still suffering from the post war inflation period but she is moving rapidly forward and creating an excess production for export. In the past ten years she has made heavy investments to capital account and her industrial growth has been nothing short of marvelous. Between 1916 and 1918 alone the amount of capital invested in new enterprises in the empire totaled over $1,700,000,000, while capital used to expand existing enterprises in the same period totaled over $1,200,000,000. She was our sixth best customer in 1919. She contends with Canada for first place as a buyer of our steel and iron. She is one of our best customers for automobiles. The empire offers one of our best markets for machinery of all kinds.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb	$0.0273	$0.0261	$0.0270
Cold finished shafting	per lb	0.0365	0.0340	0.0415
Brass rods	per lb	0.165	0.1750	0.1433
Solder (½ and ½)	per lb	0.22	0.217	0.18
Cotton waste	per lb	0.115	0.11	0.102
Washers, cast iron (½ in.)	per 100 lb.	4.00	3.83	4.06
Emergy, disks, cloth, No. 1, 6 in. dia	per 100	3.11	3.11	.....
Lard cutting oil	per gal	0.575	0.575	.....
Machine oil	per gal	0.36	0.36	.....
Belting, leather, medium	off list	40–5% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list	55% @60%	50%@ 65–10%	50%@ 60–10%

Holland's foreign trade position shows improvement. According to reports imports for July were valued at 164,000,000 gulden in comparison with 171,000,000 gulden for July, 1921, and 152,000,000 gulden for June of this year. Exports for July amounted to 105,000,000 gulden, compared with the same total for July of last year and 101,000,000 gulden for June of this year. The import balance of 51,000,000 gulden for June is the most favorable monthly balance this current year. The July, 1922, import balance of 59,000,000 gulden brings the Dutch trade balance for the first seven months of the year up to 452,000,000 gulden, compared with an import balance of about 549,000,000 gulden for the same period of last year.

Finland's foreign trade continues to increase markedly and the balance of trade is much more favorable than last year, imports for the first half of 1922 exceeding exports by only 7 per cent, whereas in 1921 imports were more than double the exports.

Automobile production in the United States declined during the month of July as compared with June although the decline was not unexpected. The high peak for the current year was reached in June with 263,017 cars and 25,985 trucks produced. Figures for July thus far available and subject to revision when all reports are received, indicate a total of 223,201 cars and 21,243 trucks produced during the month.

Fabricated structural steel sales in the United States during the month of July, according to reports made to the Department of Commerce, by almost the entire fabricating industry, amounted to 62 per cent of shop capacity as compared with 7.1 per cent in June. Actual sales in July totaled 127,765 tons as against the June figure of 204,540 tons.

Commercial failures in the United States according to reports furnished by Bradstreet totaled 368 for the past week as compared with 363 for the previous week and 395, 133, 110, 179 for the corresponding weeks 1921 to 1918. The New England States had 29, Middle 101, Western 72, Northwestern 37, Southern 87, Far Western 42. Canada had 42 failures for the week, against 48 for the preceding week. In the United States about 76.6 per cent of the concerns failing had $5,000 capital or less and 14.6 per cent had from $5,000 to $20,000 capital.

Cost of living among wage earners' families in the United States on July 15, 1922 was 55.6 per cent higher than in July, 1914, according to the results of a comprehensive investigation of conditions the country over just completed by the National Industrial Conference Board. Between June 15 and July 15, 1922, there was an increase of two-tenths of one point or one-tenth of one per cent. The changes in the budget within the month were a slight rise in clothing and food prices, and a slight decline in averages sundries prices. These changes nearly balanced each other so that there was very little change in the budget as a whole between June and July. Between July, 1920, when the peak of the rise in the cost of living since 1914 was reached, and July, 1922, the cost of living dropped 48.9 points or 23.9 per cent. Since March, 1922 the cost of living among wage earners the country over has remained practically stationary.

Machinery Duties Under the Tariff Bill

WASHINGTON CORRESPONDENCE

The tariff bill as it passed the Senate shows material reductions in many items of machinery and tools from the form in which the measure was reported to the Senate last April, even though the original recommendations of the committee in most cases were for rates below those provided by the House.

Many items were cut down by the finance committee during debate and in several instances the committee was overturned by the Senate and lower rates were written into the measure on the floor. In others, the committee reopened paragraphs after they had been adopted and asked for reductions.

In the last week of Senate consideration of the bill, the finance committee, acting through Senator Smoot, reduced the duty on high-speed steel 7 per cent. Two days before, the committee reduced the rate on structural iron and steel if not advanced beyond hammering, from the House rate of seven-twentieths of a cent per pound to one-fifth of a cent per pound and reduced to 20 per cent ad valorem the duty on structural stuff if machined, fabricated for use or otherwise advanced beyond hammering. This latter rate is 5 per cent below the House figure, which also was on the higher basis of American valuation, and is 10 per cent below the figure originally recommended by the finance committee and previously reduced to 25 per cent by it.

REDUCTIONS ON MACHINE TOOLS

Heavy reductions were made by the Senate in the duty on machine tools. The House had provided a duty of 35 per cent on the American valuation. The Senate finance committee used this same figure in its original recommendation, which really meant a reduction, because it was based upon the foreign value, but was overturned by a vote of the Senate and a rate of 15 per cent was written into the bill. This rate is the same as the existing duty under the Underwood law. The rate in the Payne-Aldrich bill was 30 per cent.

The duty on steam engines, and locomotives was left at 15 per cent, a reduction under the House duty; a duty of 25 per cent on sewing machines valued at less than $75 and 40 per cent if valued at more than amount was voted into the bill; and a 25 per cent duty on cash registers and a 30 per cent duty on combined adding and typewriting machines were written into the bill by the Senate. Rates on textile machinery were fixed at 30, 35 and 50 per cent, according to classification, which figures are below the House rates but considerably above existing customs rates.

The Senate made a material reduction in the duties to be paid on chains, the rate varying according to size.

The rates of six-tenths of a cent per pound on nuts and washers and one cent per pound on bolts, as fixed by the House, were not changed by the Senate. The rates on nails and spikes were reduced slightly. The duty on rivets and studs was cut to 20 per cent, the House rate having been 25 and the original recommendation of the finance committee having been 40 per cent.

Blacksmiths' hammers, tongs, sledges, etc., were listed at 1½ cents per pound, as the House had decided also. Babbitt metal and other lead was unchanged from the House rate of 2½ cents per pound upon the lead content and 2¾ cents per pound if in sheets, wire, etc. Leather belting, upon which a duty of 4 cents per pound was recommended, was placed on the free list by vote of the Senate.

Gaskets of asbestos paper were given a duty of 25 per cent, a reduction below the House rate. Emery carries a duty of 1 cent per pound, and a duty of 20 per cent was put on emery wheels, files and paper.

HARDWARE AND SMALL TOOLS

As the bill passed the Senate, the duty on antifriction balls and rollers is fixed at 10 cents per pound and 55 per cent ad valorem, which is an increase over the House rate of 10 cents per pound and 35 per cent ad valorem.

The House rate on axles, six-tenths of a cent per pound, was not changed by the Senate.

The finance committee fixed a rate of 20 per cent on anvils weighing less than five pounds and 45 per cent upon heavier anvils.

The classification of wood screws of iron or steel according to length was stricken out and a rate of 25 per cent was imposed regardless of size.

Pliers, pincers and nippers will bear a lower duty, if the Senate rates are accepted in conference. The House recommended specific duties according to size plus 25 per cent, on American valuation, and the finance committee raised the ad valorem to 50, on the basis of foreign valuation, which would be about the same in dollars and cents, but subsequently this figure was raised to 60 per cent by the committee and the specific duties were eliminated, thus affecting a general reduction.

The House figures on files, rasps and floats were unchanged, being 25 cents per dozen for those two-and-a-half inches in length or less; 47½ cents per dozen for those from 2½ to 4½ inches; 62½ cents per dozen for those from 4½ to 7 inches, and 77½ cents per dozen for those over 7 inches in length.

Timken Readjusts Capitalization

Readjustment of the capitalization of the Timken Roller Bearing Co. by the sale of a large amount of stock, including some held by the Timken family, has been announced by officials of the company.

The plan contemplates the sale of 400,000 of the 1,200,000 shares of stock for approximately $12,000,000 or $30 a share. The 400,000 shares are owned by the Timken family. The family will retain the balance of 800,000 shares. There will be no changes in directorate or management.

Figuring in the big transaction is a group of New York bankers headed by Hornblower & Weeks. Included in the group to make the offering will be Dominick & Dominick, C. D. Barney and Co., F. B. Koch and Co., and others. The company manufactures tapered roller bearings and supplies, according to reports, about 90 per cent of the trade.

Thread Grinder Company Acquired by A. T. Doud

The Precision and Thread Grinder Manufacturing Co., Philadelphia, Pa., well known in the machine tool and automotive industry field for its multi-graduated precision grinder, has just been acquired by A. T. Doud, of that city.

The company's new owner, A. T. Doud, president and treasurer, is a mechanical engineer of wide experience in the metal working industry and a graduate of Purdue University. He was formerly mechanical engineer for the Hale & Kilburn Co., Philadelphia, and during the war was associated with the Hero Manufacturing Co., in the capacity of general manager, in the manufacture of gas masks for the War Department.

F. V. Doud has been elected Secretary of the company and C. A. White, secretary of Leeds & Northup Co., Philadelphia, has been elected to the board of directors. F. Roger Imhoff, formerly sales manager has been appointed consulting engineer for the new organization.

The company will continue the production of its multi-graduated precision grinder on an enlarged scale, as well as its thread lead variator for obtaining lead from the ordinary lathe lead screw. It will also manufacture a gage block for testing lead screws and a permanent alignment wheel truing head for use on all precision grinders.

Bad Export Packing on Bolts, Nuts and Rivets

Chilean importers prefer sheet iron containers for nuts, bolts, and rivets, according to the Department of Commerce. They do not want shipments to come in wooden casks that break in handling. Europeans use the sheet iron containers and get the orders. One European firm recently got an order for fifteen tons of rivets by cable because American concerns are disregarding instructions to ship in double bags of heavy material which, while not as good as sheet iron kegs, are vastly better than wooden containers. On one shipment 80 per cent of the wooden kegs burst when they were let over the ship's side into lighters, the contents were scattered over the floor and had to be shoveled into bags and later sorted out by hand.

Southern Metal Trades to Meet in Memphis

The Southern Metal Trades Association, Atlanta, Ga., through William E. Dunn, Jr., president, announces that the annual meetings of the association will, hereafter, be held during the winter months, instead of in the summer as in the past. The next annual meeting will be held at Memphis, Tenn., the latter part of January or in early February, a definite date to be announced later. The association is said to have a membership representing a total invested capital of more than $50,000,000, the industries employing more than 25,000 workers.

Machinery Prospects Abroad

WASHINGTON CORRESPONDENCE

Information reaching the Department of Commerce through its special agents abroad, through the consuls, and through its correspondence with individuals leads to the conclusion that the United States will furnish more metal-working machinery to the foreign market than it ever has before once that the transitory period incident to reconstruction is past. During the twelve months ended with June, the total exports of metal-working machinery were valued at $11,239,330. This is less than one-fifth of the value of the exports during the calendar year of 1919. During the war and until the close of 1920, American metal-working machinery was shipped abroad in such large quantities that it has become very widely known and its merit thoroughly established.

Metal-working machinery would be among the last commodities to feel the effect of a quickened buying power, it is pointed out at the Department of Commerce. Returning prosperity is first reflected in the demand for foodstuffs and clothing. Then come other staples and the luxuries, but before machinery buying increases perceptibly the wave of prosperity must be well advanced.

The specialists at the Department of Commerce expect to see the improvement in the demand for metal-working machinery mount steadily but the increase is certain to be gradual. The conditions abroad which forced the monthly average of metal-working machinery exports below $1,000,000 during the last fiscal year are passing, they declared, but there is nothing in the situation to encourage them to think that there will be any rapid expansion in the demand during the present fiscal year. During the last fiscal year Germany offered a competition which American manufacturers could not meet. Much of the advantage which the Germans held, however, was temporary and as costs of production catch up with the depreciation of the mark, the margin of advantage grows narrower and narrower. Moreover Germany lost so much of her skill during the war that it is being reflected in the quality of her machinery. Even now with prices greatly in favor of the German article, American machinery is being sold with quality arguments.

BARTER METHODS IN SELLING

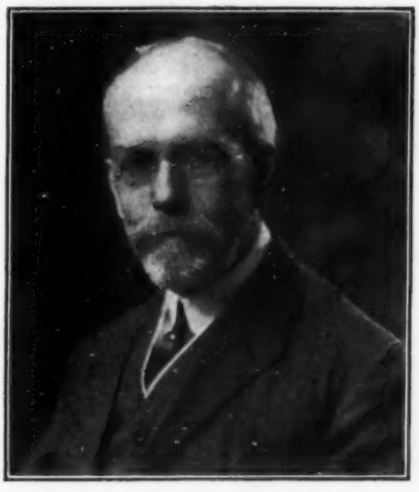
Both German and English competitors have had an advantage over the American manufacturer in their need for a great variety of commodities. Wool is a good example. In Argentina instances are known where machine tools were sold on a formal agreement to accept wool in payment. What is tantamount to the same situation has existed in many countries. The Germans, the English and the French have been more ready to set up this type of barter than have the American manufacturers.

The fact that Europe has been economizing as never before has affected the purchasing power of metal-working machinery consumers throughout the world. Europe is not buying and as a result large stocks of raw materials and semi-finished materials piled up in many countries, this threw an unusual load on their banks and business houses from being called upon to conduct financing on a larger scale than ever before. This made money hard to get for manufacturing and other enterprises. Since many years are certain to be required before the new normal is reached, the rehabilitation of the export business in metal-working machinery is certain to take some time, according to those who are studying that situation closely at the Department of Commerce. They are convinced, however, that once reconstruction has been accomplished, it will be found that American manufacturers are supplying a much larger proportion of the world's metal-working machinery requirements than ever before was the case.

Coleman Sellers, Jr.

COLEMAN SELLERS, JR., president of William Sellers and Co., Inc., died on Tuesday, Aug. 15, in his seventieth year after an illness of several months.

His connection with the Sellers house, then a firm, began in 1873 immediately after his graduation from the University of Pennsylvania when, after serving a practical course in the shops for several years, he took a position in the drafting room of which he soon became the head. He was appointed assistant



manager in 1887, becoming at the same time a director of the company. He was elected engineer in 1902, and president in May 1905, holding this office continuously until his death.

He came from progenitors who, in the four preceding generations, gave many evidences of unusual mechanical and engineering ability, and the first of whom came to this country from Derbyshire, England, in 1682. His father, Coleman Sellers, a member of the Sellers firm in 1873, was one of the most brilliant mechanical engineers of his time, and of most versalite talents. Like his father, Coleman Sellers, Jr., was also a man of many parts and of liberal ideas, and while his principal inclinations and activities were in mechanical and engineering lines, he took keen interest in many other directions, scientific, literary, educational and the arts, and he was active in the civic life of Philadelphia as well as in city, state and national betterments.

He was long active in the affairs of the Franklin Institute, of which he was vice-president at the time of his death. He was a member of the Board of Commissioners of Navigation of Pennsylvania, to which he was appointed in 1907. He took special interest in the work of the American Philosophical Society, the American Society of Mechanical Engineers, the American Society of Naval Architects and Marine Engineers and the Engineers Club of Philadelphia of which he was one of the founders. He was president of the Philadelphia Chamber of Commerce from 1909 to 1913.

He served as chairman of Local Draft Board No. 20 during the early stages of our country's entrance into the war and with such fidelity and assiduity to both the Government and the draftees, that his intimates have since been convinced it seriously impaired his health and contributed not a little to his subsequent illness and death. It can therefore well be said that he too, made physical sacrifice to the Great War.

Mr. Sellers was a most lovable man, kind and considerate to all with whom he came in contact whatever their station in life. He had an especial sympathy for the young men of his profession, those just stepping upon the lower rounds of the ladder which he had climbed so brilliantly and successfully.

He had a keen sense of humor coupled with a most unusual fund of anecdotes. He was quick in repartee but never caustic or resentful. He could be sedate or gay, so that his presence in any gathering imparted an atmosphere suited to the occasion. His passing is a severe loss to his city, state and country; to his company and his associates therein, as well as to a very wide circle of friends.

Business Items

The Sanford Riley Stoker Co. and The Murphy Iron Works announce a change of address from 233 Broadway to Room 607, Terminal Building, 103 Park Ave., New York City.

The New England Brass Manufacturing Co., 5 Maple Avenue, Danbury, Conn., incorporated recently under the laws of Connecticut, organized the company during the past week by the election of the following officers: president and treasurer, M. Quamruddin, and secretary, D. S. Bradley, both of Danbury.

The Greenfield Tap and Die Corporation has steadily increased its operations in the last few months, except for a short midsummer period, and now has more than 700 employed in the various departments. Its "Little Giant" wrench, its latest new product, is now being brought to quantity production.

The Wico Electric Co., Springfield, Mass., opened bids Aug. 24 for a new building in West Springfield, planned to be the first of five units, each 400 x 90 ft., one story, brick construction. Beginning Jan. 1, 1923, the company will have in production a new magneto for engines under 5 hp. or smaller than those for which it has hitherto provided equipment. Operations in the new building which is to be ready at the beginning of the year, are to be started with a force of 200, with a view to

doubling that number in the near future. In addition to its old quarters on both sides of Taylor Street the company has rented the top floor of the American Electric Service & Maintenance Co.'s new building in the same street, to meet requirements until the new building is ready.

The Remington Typewriter Co. has resumed operations at its plant in Syracuse after two weeks' shutdown for inventory and vacations.

The Laughlin-Barney Machinery Co., Union Arcade Building, Pittsburgh, Pa., has opened a branch office in Erie, Pa., 1022 Sassafras Street, with Samuel Matchett in charge.

The L. A. Young Industries has purchased the plant of the Denby Motor Truck Co., Detroit, according to reports. The factory, which is located at Holbrook avenue and the Grand Trunk Railroad, contains approximately 100,000 square feet of floor space, together with 5¼ acres of ground. The L. A. Young Industries will manufacture the Helicon spring, a comparatively new product, in the newly acquired plant.

S. F. Bowser and Co., Fort Wayne, Ind., recently announced the appointment of L. E. PORTER, as assistant general manager. Mr. Porter, for the past three years, has been director of publicity. ROSCOE L. HEATON, formerly assistant to the president, now becomes advertising manager.

The Landis Tool Co. announces that, owing to increased cost of production, it has been found necessary to advance prices ten (10) per cent on all machines and machine parts, effective Aug. 15, 1922.

The Hunter Saw and Machine Co., Pittsburgh, Pa., announces that it has opened an office on 56 Pine Street, New York City, where they will carry a complete stock of metal cutting circular saw blades, as well as pneumatic hammer rivet sets and chisel blanks. Frank H. Harrison will be in charge.

The Ford Instrument Co., Inc., announces the removal of its offices and factory to its new building, Rawson St. and Nelson Ave., Long Island City, N. Y.

The Stewart-Warner Speedometer Corporation reports profits of $2,122,049 for the six months ended June 30, 1922, after expenses, depreciation, etc. This compares with $652,872 in the same period a year ago. The company's surplus for the period is $1,277,151 after Federal taxes and dividends, against a surplus of $52,872 in 1921. The total unappropriated surplus as of June 30 last is placed at $8,929,351.

Joyce Bros., Ltd., structural, civil and mechanical engineers, are opening an office at Bronte, Ont.

The Durham Manufacturing Co., of Durham, Conn., has been incorporated under the laws of Connecticut, to manufacturer metal and brass specialties, etc. The capital stock is $25,000, and the incorporators are Adolph J. Bode, Edgar S. Francis, Arthur F. Hall, Harry C. Rich, Paul Mathewson, Leonard B. Markham and William C. Hubbard.

The Hartford Valve Manufacturing Co., of Hartford, Conn., has been incorporated under the laws of Connecticut, to make and deal in valves, etc. The capital stock of the concern will be $50,000, and the incorporators are Mitchell S. Little, of the M. S. Little Manufacturing Co., Hartford; Michael H. Flynn and H. Bissell Carey, both of Hartford also.

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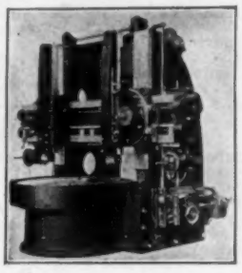
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Boring and Turning Mills, Vertical, Heavy-Duty
Colburn Machine Tool Co., Cleveland, Ohio
"American Machinist," June 1, 1922.



The machine is furnished in 42-, 48-, 54-, 62-, 72- and 84-in. sizes. It possesses a single-lever control for feed and rapid traverse of the heads and rams, automatic gravity lubricating system, forced lubrication of angular and vertical spindle bearings, spring counter-weighting of rams and turret slide, friction disk clutches to raise and lower the crossrail, and single-pulley drive. Four of the twelve speed changes are provided by the speed-change gear box and three by a secondary unit in the base. Sixteen changes of feed from 0.006 to 1 in. per revolution of the table are available for both horizontal and vertical movements. Each head is independently controlled.

Drilling Machine, Sensitive, "Superspeed," 13-in.
Fosdick Machine Tool Co., Cincinnati, Ohio
"American Machinist," June 1, 1922.

The machine is built in both bench and pedestal types, and in combinations of from one to eight spindles. Three spindle speeds of 5,700, 8,000 and 12,000 r.p.m. are available, although other speeds may be substituted. By a special speed-changing arrangement, a single turn of a handle automatically releases the belt tension, and shifts the belt. In the pedestal machine, the elevating table is of the quick-acting counterbalanced type, with the clamping handle in front. The traverse is 10 in. The counterbalanced head has a vertical traverse of 6 in. Capacity, drills up to ¾ in. in diameter in steel, iron or brass. Weight, bench type, 225 lb.; pedestal type, 464 pounds.

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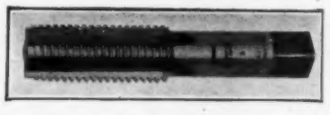
John Bath & Co., Worcester, Mass.
"American Machinist," June 1, 1922.



The shape of the flute of the tap leaves a projecting face upon which is the cutting edge. The cutting face is undercut to give the effect of top rake. The taps are ground to size and to their final shape after hardening. The first four teeth are eccentrically ground, but the remainder of the cutting part is concentric and the outside diameter is uniform. Beginning with the fifth tooth and continuing for four or five turns, the pitch diameter is constant and to exact nominal size. From this point, however, the pitch diameter falls away in a uniform taper toward the shank, where at the last turn it is 0.00125 in. under size. Regrinding does not impair the accuracy of the tap.

Necking Attachment for P. & W. Full Automatic Lathe
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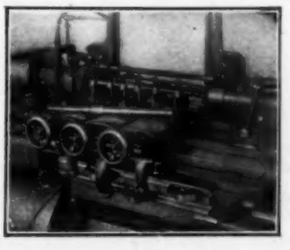
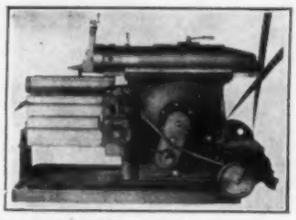


The attachment is used for squaring shoulders or necking below the turned surfaces of work being prepared for grinding, and is adaptable to other operations where the crossfeed can be utilized. It consists of multiple carriages that replace the regular carriage of the lathe; and one, two or three of these carriages may be adjustably clamped to the front way of the bed. Each carriage has a regular toolslide or a multiple toolpost. Adjustment for depth of cut is made by handwheels mounted on screws carrying graduated dials. The cross-slides are actuated by cams, which can be adjusted to provide any sequence of the cross movements, or all slides may be moved in unison.

Shaper, Crank, 32-Inch
R. A. Kelly Co., Xenia, Ohio
"American Machinist," June 1, 1922.



The shaper is intended particularly for heavy duty in railroad and forge shops. The table is of the revolving type, and work may be clamped on either side or on the top. The feed does not operate during the cutting stroke of the ram, and its direction is controlled by a lever on the top of the box, while the amount of the feed is controlled by the lever on the side. The gear box has four changes of speed engaged by a ball lever on top of the box. The clutch and brake are controlled by a long lever at the front of the shaper. All machines may be easily fitted with motor equipment, and a gear box may be quickly installed. Extreme stroke, 33 in. Vertical table movement, 12½ in. Cross traverse, 30 in. Weight, 6,500 pounds.

Thermometer, Resistance, Direct-Reading
Brown Instrument Co., Philadelphia, Pa.
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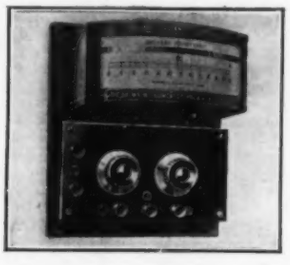

The thermometer is intended for accurately gaging a high temperature when only a small range is required. A more accurate reading than when the range on the scale starts at zero, can be obtained by the large sized degree divisions. The change in electrical resistance occurring in metals with a change in temperature can be accurately measured, and a scale can be calibrated to read directly in degrees of temperature. Bulbs can be furnished for all uses, for high or low temperatures or for use in chemical processes. In dry kilns, the instrument can be employed to measure both temperature and humidity.

Chuck, Differential, Scroll-type
E. Horton & Son Co., Windsor Locks, Conn.
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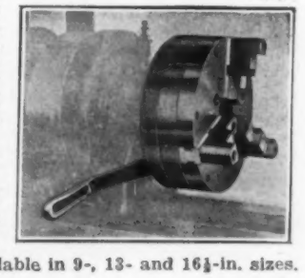

The chuck is for use on turret and engine lathes. The power of the machine is utilized to close the jaws and grip the work. When the chuck is running forward with the lathe, if the handwheel is pressed and its movement stopped, the scroll-plate will close the jaws. One revolution of the handwheel moves the chuck jaws $\frac{1}{32}$ in. radially. A quick forward movement of the handwheel will deliver a hammer blow upon the gear train, and will release the grip. The handwheel turns easily and may be spun rapidly backward or forward to open or close the jaws. The chuck is available in 9-, 13- and 16½-in. sizes.

Sanding Machine, Belt, Self-Contained, No. 183
Oliver Machinery Co., Grand Rapids, Mich.
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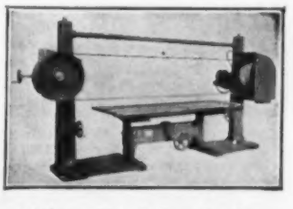

The machine is adapted particularly to rapidly sanding and polishing flat or irregular wooden surfaces, as well as to polishing metal surfaces. The sand belt pulleys run in either direction on ball bearings that are provided with vertical individual adjustment. The bearing housings are moved by handwheels. With the slow-speed motor drive, the motor is directly connected to the driving pulley, or a high-speed motor may be geared to the pulley. The machine will take work of any length, and sand to the center of a 72-in. circle. It will hold work 42 in. high on the table. Without the table, work 66 in. high from the floor can be accommodated. Table: 96 in. long, 32 in. wide; travel, 36 in. horizontally; adjustment, 14 in. vertically. Belt: 31 ft. long; width, up to 10 inches.

Clip, paste on 3 x 5-in. cards and file as desired

doubling that number in the near future. In addition to its old quarters on both sides of Taylor Street the company has rented the top floor of the American Electric Service & Maintenance Co.'s new building in the same street, to meet requirements until the new building is ready.

The Remington Typewriter Co. has resumed operations at its plant in Syracuse after two weeks' shutdown for inventory and vacations.

The Laughlin-Barney Machinery Co., Union Arcade Building, Pittsburgh, Pa., has opened a branch office in Erie, Pa., 1022 Sassafras Street, with Samuel Matchett in charge.

The L. A. Young Industries has purchased the plant of the Denby Motor Truck Co., Detroit, according to reports. The factory, which is located at Holbrook avenue and the Grand Trunk Railroad, contains approximately 100,000 square feet of floor space, together with 5¼ acres of ground. The L. A. Young Industries will manufacture the Helicon spring, a comparatively new product, in the newly acquired plant.

S. F. Bowser and Co., Fort Wayne, Ind., recently announced the appointment of L. E. PORTER, as assistant general manager. Mr. Porter, for the past three years, has been director of publicity. ROSCOE L. HEATON, formerly assistant to the president, now becomes advertising manager.

The Landis Tool Co. announces that, owing to increased cost of production, it has been found necessary to advance prices ten (10) per cent on all machines and machine parts, effective Aug. 15, 1922.

The Hunter Saw and Machine Co., Pittsburgh, Pa., announces that it has opened an office on 56 Pine Street, New York City, where they will carry a complete stock of metal cutting circular saw blades, as well as pneumatic hammer rivet sets and chisel blanks. Frank H. Harrison will be in charge.

The Ford Instrument Co., Inc., announces the removal of its offices and factory to its new building, Rawson St. and Nelson Ave., Long Island City, N. Y.

The Stewart-Warner Speedometer Corporation reports profits of $2,122,049 for the six months ended June 30, 1922, after expenses, depreciation, etc. This compares with $652,872 in the same period a year ago. The company's surplus for the period is $1,277,151 after Federal taxes and dividends, against a surplus of $52,872 in 1921. The total unappropriated surplus as of June 30 last is placed at $8,929,351.

Joyce Bros., Ltd., structural, civil and mechanical engineers, are opening an office at Bronte, Ont.

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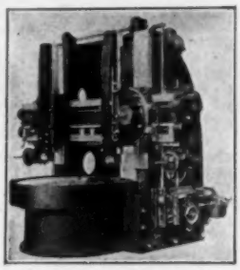

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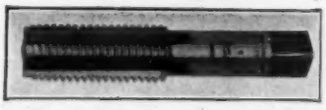

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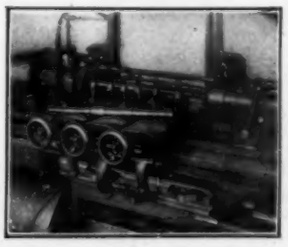

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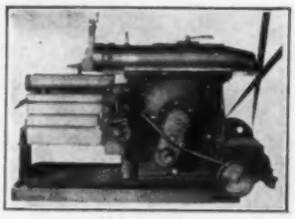

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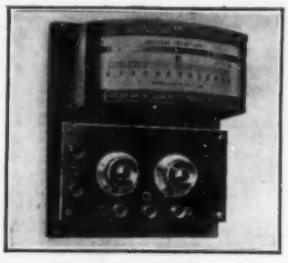

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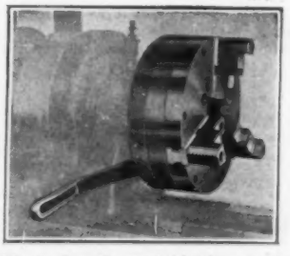
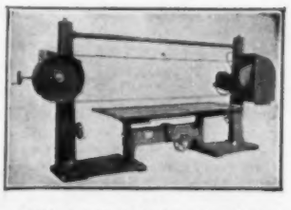
"American Machinist," June 1, 1922.



The chuck is for use on turret and engine lathes. The power of the machine is utilized to close the jaws and grip the work. When the chuck is running forward with the lathe, if the handwheel is pressed and its movement stopped, the scroll-plate will close the jaws. One revolution of the handwheel moves the chuck jaws ⅛ in. radially. A quick forward movement of the handwheel will deliver a hammer blow upon the gear train, and will release the grip. The handwheel turns easily and may be spun rapidly backward or forward to open or close the jaws. The chuck is available in 9-, 13- and 16½-in. sizes.

Sanding Machine, Belt, Self-Contained, No. 183
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," June 1, 1922.



The machine is adapted particularly to rapidly sanding and polishing flat or irregular wooden surfaces, as well as to polishing metal surfaces. The sand belt pulleys run in either direction on ball bearings that are provided with vertical individual adjustment. The bearing housings are moved by handwheels. With the slow-speed motor drive, the motor is directly connected to the driving pulley, or a high-speed motor may be geared to the pulley. The machine will take work of any length, and sand to the center of a 72-in. circle. It will hold work 42 in. high on the table. Without the table, work 66 in. high from the floor can be accommodated. Table: 96 in. long, 32 in. wide; travel, 36 in. horizontally; adjustment, 14 in. vertically. Belt: 31 ft. long; width, up to 10 inches.

Clip, paste on 3 x 5-in. cards and file as desired

Hill, N. Y., died very suddenly while in England according to a cablegram received from his wife. He went to England some months ago to recuperate from a recent illness.

ALBERT G. LAIRD, formerly secretary and treasurer of the McRae and Roberts Brass Works, Detroit, Mich., died recently at his home in Wallaceburg, after an illness of two months.

LOUIS C. STEGER, member of the board of directors and director of purchases of the S. F. Bowser & Co., Fort Wayne, Ind., died, August 20, 1922.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Commercial agent in Sweden desires to secure the exclusive representation of firms for the sale of motors, automobiles, flying motors, tractors, woodworking machinery, etc. Reference. No. 3197.

The purchase is desired by a merchant in Wales of type-setting machinery, types, and machines used in the printing trade. Quotations, c.i.f. Welshport or Bristol channel port. Reference, No. 3203.

Commercial representatives in New Zealand desire to secure an agency for the sale of galvanized fencing wire, staples, nails and allied products. Quotations, c.i.f. Wellington or Napier. Reference. No. 3219.

Company in India desires to purchase or secure an agency for hardware, steel products, and structural steel. Quotations, c.i.f. Karachi. Reference No. 3234.

A merchant in Canada wishes to purchase box strapping. Quotations, f.o.b. port of shipment. Payment, cash. Reference No. 3737.

A hardware company in Mexico wishes to purchase all kinds of hardware, plumbing supplies, sheet iron, iron piping, paints and varnishes, and arms and ammunition. Quotations, c.i.f. El Paso, Tex. Cash to be paid. Reference No. 3247.

A manufacturers' representative in Italy desires to purchase steel for the manufacture of ball bearings. Quotations, c.i.f. Genoa or Savona. Terms, cash against documents. Reference No. 3272.

A commission merchant in Cuba desires to be placed in touch with exporters of flour milling machinery. Reference No. 3273.

The representative of an American firm in Italy desires to secure an agency for the sale of automatic price-registering scales, leather, rope, electric wire, tin plate, and aluminum products. Quotations, c.i.f. Italian port. Reference No. 3295.

A manufacture in Mexico wishes to purchase pressed tin sheets of different colors and designs, and locks, handles, trimmings and other materials for the manufacture of trunks. Reference No. 3300.

Firm of commission merchants in the Punjab, India, desires to secure an agency for the sale of metal sheets, and hardware. Quotations, c.i.f. Indian port. Reference No. 3304.

Firm in Sweden wishes to secure an agency for the sale of cigarette-making machinery, especially adapted to the manufacture of Russian cigarettes. Quotations f.o.b. American port. Reference No. 3331.

A business man in Switzerland desires to secure an agency for the sale of detachable outboard marine motors, automobiles, and automobile accessories. Quotations, c.i.f. European port. Correspondence, German. Reference No. 3345.

A firm of commission agents in Canada desires to secure an agency for the sale of cutlery, hardware specialties, silver-plated ware and needles. Quotations, f.o.b. Canadian port. Reference No. 3352.

A buying association in Greece desires to purchase mild round steel bars for concrete reinforcement, in shipments of 50 to 100 tons, 12 to 15 meters long, and 5 to 30 millimeters in diameter. Quotations, c.i.f. Piraeus, Saloniki, and Smyrna. Payment arranged by confirmed letter of credit in the United States. Reference No. 3349.

Book Reviews

Forms, Records and Reports in Personnel Administration. By C. N. Hitchcock. Paper covers, one hundred and twenty-eight 6 x 9-in. pages. Published by the University of Chicago Press, Chicago, Ill. Price, $1.75.

The handbook is a collection of representative records and reports designed to give the industrial personnel managers that kind of information which will best enable them to determine policies wisely and to administer the policies effectively. The book is divided into seven parts. Part I takes up the functional organization for personnel administration. Forms and records are given in Part II for the employment section, in Part III for the training section, in Part IV for the health and safety section, and in Part V for the research and planning section. Part VI deals with profit sharing, insurance and benefit forms, while in Part VII are given statistical reports for managerial use. The records are complete in detail and cover all the data necessary in personnel management.

Pamphlets Received

Variable Speed Transmission. The Reeves Pulley Co., Columbus, Ind. An useful pocket manual on variable speed transmission. The booklet is designed to place before engineers, millwrights, factory superintendents and operators complete information which will enable them not only to plan installations, but to care for and operate them most efficiently.

The Importance of Correct Lubrication. Phinney Brothers Co., Oil City, Pa. A pamphlet of 20 pages outlining some of the troubles occurring in motor vehicles and marine motors due to incorrect lubrication and helpful hints as to means of correcting the difficulties.

Handbook of the Electric Power Club. The Electric Power Club, Kirby Building, Cleveland, Ohio. This publication marks the 14th edition of the handbook of the Electric Power Club, covering substantially all the standardization it has effected in electric motors, motor pulleys, generators, transformers, electric tools, mining and industrial locomotives, control equipment, power switchboards and switching equipment manufactured in this country.

The Treatment of Carbon Monoxide Poisoning. Reprint No. 728, from the Public Health Reports, Treasury Department, United States Public Health Service, by R. R. Sayers, past assistant surgeon, and H. R. O'Brien, assistant surgeon.

Trade Catalogs

Wood Split Pulleys. The Reeves Pulley Co., Columbus, Ind. Catalog No. P-33, just issued, containing thirty-one pages. The catalog illustrates and describes in detail the various styles and sizes of Reeves wood split pulleys, wood sheaves and fly wheels. The publication will be sent to parties interested in conjunction with the Engineers Manual of variable speed transmission when desired.

Milling Cutters. The Lovejoy Tool Co., Inc., Springfield, Vt. A new catalog of 14 pages, containing numerous illustrations showing the company's line of positive locked inserted tooth milling cutters. The catalog also describes the company's stellite blades, taper shank arbors and multiple cutter boring heads.

Printing Press Control. The Monitor Controller Co., Baltimore, Md. Bulletin No. 103, just issued, containing 32 pages. This publication should be of exceptional interest to all printing press manufacturers and users. It contains complete description matter with numerous illustrations on the company's Monitor automatic equipment for the control of printing presses, binding and other printing shop auxiliary machinery. The illustrations, showing the application of the equipment in various plants, are interesting and instructive, and the publication deserves praise for the care shown in its arrangement.

Lock Nuts. The Drake-Lock Nut Co., 2440 E. 75th St., Cleveland, Ohio. A folder describing the company's line of lock-nuts, of especial interest to motor car, tractor, truck, engine and machinery builders.

Flexible Shafts. The Hergi Manufacturing Co., 250 Fifth Street, Bridgeport, Conn. Supplement catalog No. 16, just issued, describing the Hergi Flexible shaft equipment especially adapted for grinding and screw driving.

Galvanometers. The Roller Smith Co., 233 Broadway, New York City. Bulletin No. 250, just issued, containing illustrations and descriptive matter on the portable direct current galvanometers made by this company.

Centrifugal Pumps. The Pennsylvania Pump and Compressor Co., Easton, Pa. A new bulletin, known as Bulletin No. 202, containing illustrations and descriptive matter on the company's line of double suction single stage centrifugal pumps with useful engineering data.

Gears. The W. A. Jones Foundry and Machine Co., Chicago, Ill. Catalog No. 24, just issued, giving full details of the numerous styles of Gears manufactured by this company. The publication is both a catalog and a handbook on gears, containing complete dimension data on all sizes manufactured as well as standard gear tables of use to the engineer, draftsman and purchasing agent.

Cranes. The Northern Engineering Works, Detroit, Mich. Bulletin No. 524, just issued with numerous illustrations of the jib, truck, and stacking cranes manufactured by this company and their practical application.

Forthcoming Meetings

Association of Iron and Steel Electrical Engineers. Annual convention, Sept. 11 to 15 at the new auditorium, Cleveland, Ohio. Secretary, John F. Kelly, Empire Building, Pittsburgh, Pa.

American Institute of Mining and Metallurgical Engineers, annual convention, Sept. 25 to 28, 1922, San Francisco, Cal. Secretary, F. F. Sharpless, 29 West 39th Street, New York City.

American Society of Mechanical Engineers, regional meeting, Sept. 25, 26 and 27,1922, Hotel Kimball, Springfield, Mass. Secretary Calvin W. Rice, 29 West 39th Street, New York City.

American Society for Steel Treating. Exposition and convention at the General Motors Co. Building, Detroit, Oct. 2 to 7. W. H. Eisenman, 4600 Prospect Ave., Cleveland, is secretary.

American Gear Manufacturers' Association. Fall meeting, Chicago, Ill., Oct. 9, 10 and 11, 1922.

American Manufacturers Export Association annual convention. New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

American Trade Association Executives. Third annual meeting, Oct. 25, 26 and 27, 1922, at the Inn, Buck Falls, Pa., (Delaware Water Gap).

National Machine Tool Builders' Association, annual convention. New York City, October, 1922. Secretary, E. F. Du Brul, 817 Provident Bank Building, Cincinnati, Ohio.

National Founders Association, Nov. 22 and 23. Secretary, J. M. Taylor, 29 South La Salle St., Chicago, Ill.

American Society of Mechanical Engineers, annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Exposition of Power and Mechanical Engineering. Dec. 7 to 13, 1922. Grand Central Palace, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

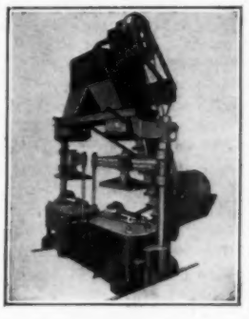
Stud Setter, Self-Opening, "Jarvis"
Geomet Tool Co., New Haven, Conn.
"American Machinist," June 1, 1922

The tool is simple in design and provides a quick grip and release for the work. The setter is made in three sizes. The No. 1 size has a capacity up to ¼-in. studs, and is provided with a No. 2 or 3 Morse taper shank. The No. 2 size has a capacity up to ⅞ in., and Nos. 3 or 4 taper shanks. The capacity of the No. 3 size is up to 1¼ in., and Nos. 4 or 5 shanks are used. Special sizes of taper shanks can be furnished to suit particular needs, and special sizes of jaws can be supplied.

Press, Power, Flexible
General Manufacturing Co., 255 Meldrum Ave., Detroit, Mich.
"American Machinist," June 8, 1922

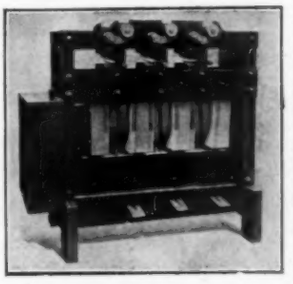
The press is adapted to straightening, pressing in bushings, and assembling parts having press fits. As it has a stroke of 9 in., it may also be used for push broaching. The pressure applied may vary from a few pounds to 8 tons. The press is a three-post machine, mounted on a base with the table top 30 in. from the floor. Two of the posts are in tension, the third post is under compression. Power applied to the pulley by the belt drives the ram at constant speed in one direction. The nut turns with the ram until pressure is applied on the pedal, which action applies a brake that stops the nut and causes the ram to descend. The height between the ram and table is ordinarily 12 inches.

Molding Machine, Portable, Duplex, Self-Contained, Model 12-36, Type D.
William H. Nicholls Co., Inc., 2 College Place, Brooklyn, N. Y.
"American Machinist," June 8, 1922



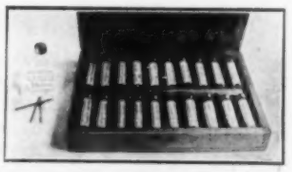
The machine consists of two stripping-plate molding machines mounted on the same base with a riddle, sand conveyor and a double boot hopper having sand gates. It is mounted on four wheels running on steel rails. The combination squeeze and drawing action semi-automatically squeezes on the up-stroke of the piston and draws by gravity on the down-stroke. Each half of the machine is operated separately by means of one valve for jolting, squeezing and drawing the patterns. The sand is conveyed to the hopper, dropped into the flask and made into molds, which are set on the floor directly in front of the machine as it travels along. Height, 10 feet.

Heater, Forging, Electric, Two-Path, Berwick
American Car and Foundry Co., New York, N. Y.
"American Machinist," June 8, 1922



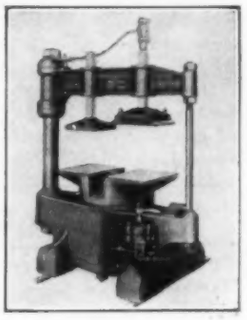
The machine is intended for heating the ends of bar stock or points along the length of the material, and can be operated on either 220 or 440-volt current. The heaters are ordinarily built with one, two or three electrodes, but may be supplied with four or five. The right-hand electrode of each unit has a vertical movement operated by a treadle, and a horizontal adjustment operated by sliding the clamping device along its shaft. The left-hand electrode may be adjusted horizontally. Length of heat, 1 to 8 in. or 3 to 11 in. Range of stock diameter with No. 3 heater, ⅜ to ⅞ inches.

Measuring Wires, Thread, Precision
Van Keuren Co., 362 Cambridge St., Boston, Mass.
"American Machinist," June 1, 1922



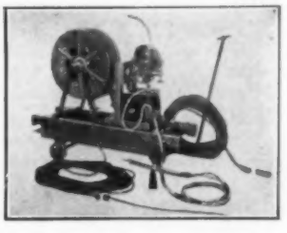
The wires are used in the measurement of screw threads, angles and profile gages and are made by methods similar to those used in the manufacture of gage blocks. They are 1¼ in. in length, and are lapped the full length. The wires provided for each thread measurement are of the theoretical diameter to touch on the pitch line, or at the pitch diameter of a perfect thread. They are packed in glass bottles, the labels on which show the calibrated diameter of the wires to hundred-thousandths of an inch. The set shown includes wires for measuring U. S. F. threads of from 6 to 36 threads per inch. Additional sizes are made ranging from a ¼-in. diameter measuring plug to wires 0.00641 in. in diameter for measuring screws with 90 threads per inch.

Molding Machine, Duplex, Portable, Model 14-42
William H. Nicholls Co., Inc., 2 College Place, Brooklyn, N. Y.
"American Machinist," June 8, 1922



The Model 14-42 machine is intended principally for making copes and drags simultaneously. There are two adjustable screw heads. The cope can be made on the split pattern plate attached to the jolt head, and the drag can be made on the right-hand side and rolled over before squeezing. The pattern can be drawn with the electro-magnetic drawing device and both halves can be squeezed at the same time. The valve is placed low and has a horizontal handle that is easily accessible. The machine has a 6-in. length of jolt and a 14-in. squeeze.

Welding Set, Arc, Electric, Semi-Automatic, Portable
General Electric Co., Schenectady, N. Y.
"American Machinist," June 8, 1922



The welding equipment consists of a semi-automatic lead, an automatic welding head with control mechanism, and a standard for holding a reel of electrode wire. Power is supplied to the arc through a flexible cable having a plug for attachment to the nearest welding circuit. The reel carrier is equipped with a brake and is intended to hold any size of reel up to 2½ ft. in diameter. Since the welding operation is continuous, interruptions which tend to affect the strength of the weld, are reduced. Weight, 400 pounds.

Drill, Pneumatic, Portable, Thor, "Pigmy"
Independent Pneumatic Tool Co., Chicago, Ill.
"American Machinist," June 8, 1922

The drill has a pistol-grip handle, with the control valve in easy reach, and is non-reversible. It is made in three sizes, the No. 25 size having a drilling capacity of ¼ in. and weighing only 5 lb., the No. 375 size having a capacity of ⅜ in. and weighing 5½ lb. and the No. 50 size having a capacity of ½ in. and weighing 6 lb. The speeds of the tools are 2,200, 1,400 and 1,000 r.p.m., respectively. The drills are fitted with Jacobs chucks, the No. 25 having a No. 1B chuck, the No. 375 a 2B, and the No. 50 a 6B. A screwdriver attachment and wire brush can be furnished. The tool can also be employed for reaming and wood boring.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Shapes plates and bars quoted at $2@$2.10, f.o.b. Pittsburgh, on new business. Quotation of $1.80 per 100 lb. disappearing from the market. Scarcity of basic iron; heavy inquiries from consumers for foreign iron. Steel structurals also scarce; fabricators quoting on no deliveries before end of last quarter. Shape mills mostly out of market on current business. Steel pipes up $6 per ton at mill; discounts reduced 3 points on new Pittsburgh basing card of Aug. 23. Mill rise reflected in New York and Cleveland warehouses; discounts reduced 3 points on black pipe in both cities since Aug. 8. Steel sheets advanced 25c. per 100 lb. in New York and Cleveland, during last two weeks.

Lead quoted in New York warehouses at 6.2c. as against 6.1c. per lb. Copper prices unchanged; zinc slightly higher in St. Louis. Dealers' purchasing prices of old metals (non-ferrous) higher in Cleveland. Cotton waste (white) quoted at 9c.@11½c. as against 7½c.@10c. per lb. in New York; rise due to mill scarcity caused by textile strike.

Declines—Tin quoted at 32½c. as compared with 33½c. per lb. one week ago, in New York warehouses. Linseed oil down 3c per gal. (5 bbl. lots) in Cleveland; no change in New York and Chicago.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.55
Northern Basic	28.27
Southern Ohio No. 2	27.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	32.44
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	33.64
Virginia No. 2	30.17
Basic	27.25
Grey Forge	31.50
CHICAGO	
No. 2 Foundry local	30.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.50
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.00
Basic	26.00
Bessemer	27.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Cincinnati	15.0	10.0	4.75
Detroit	10@12	8.0	3@4
New York	9@10	6.0	4.0
Cleveland	8.75	6.5	4.5
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40@2.60	4.03	3.50	3.90
No. 12	2.45@2.65	4.08	3.55	3.95
No. 14	2.50@2.70	4.13	3.60	4.00
No. 16	2.70@2.90	4.23	3.70	4.10
Black				
Nos. 17 and 21.	3.00@3.25	4.30	4.05	4.60
Nos. 22 and 24.	3.05@3.30	4.35	4.10	4.60
Nos. 25 and 26.	3.10@3.35	4.40	4.15	4.65
No. 28	3.15@3.40	4.50	4.25	4.75
Galvanized				
Nos. 10 and 11.	3.15@3.40	4.60	4.10	5.60
Nos. 12 and 14.	3.25@3.50	4.70	4.20	5.70
Nos. 17 and 21.	3.55@3.80	5.00	4.50	6.00
Nos. 22 and 24.	3.70@3.95	5.15	4.80	6.15
No. 26	3.85@4.10	5.30	4.95	6.30
No. 28	4.15@4.40	5.60	5.25	6.60

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	68	56½	¾ to 1¼	44½	29½
		LAP WELD			
2	61	49½	2	39½	25½
2½ to 6	65	53½	2½ to 4	42½	29½
7 to 8	62	49½	4½ to 6	42½	29½
9 to 12	61	48½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1¼	66	55½	¾ to 1¼	44½	30½
2 to 3	67	56½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	59	48½	2	40½	27½
2½ to 4	63	52½	2½ to 4	43½	31½
4½ to 6	62	51½	4½ to 6	42½	30½
7 to 8	58	45½	7 to 8	35½	23½
9 to 12	52	39½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	60%	47%	57½%	45½%	62½%	48½%
2½ to 6 in. steel lap welded	57%	44%	55½%	42½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.85
Hoop steel	4.03	3.50	3.70
Cold rolled strip steel	6.50	8.25	6.15
Floor plates	5.20	4.91	5.28
Cold finished shafting or screw	3.65	3.45	3.70
Cold finished flats, squares	4.15	3.95	4.20
Structural shapes (base)	2.93	2.76	2.80
Soft steel bars (base)	2.83	2.66	2.70
Soft steel bar shapes (base)	2.83	2.66	2.70
Soft steel bands (base)	3.63	3.06	3.45
Tank plates (base)	2.93	2.76	2.80
Bar iron (2.35 at mill)	2.83	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
5/32	8.00		12@13
¼	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	32.50
Lead (up to carlots), St. Louis 5.55@5.60; New York	6.20
Zinc (up to carlots), St. Louis 6.25; New York	7.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	19.00
Antimony (Chinese), ton spot	5.50	7.50	6.50
Copper sheets, base	21.00	21.50@21.75	23.00
Copper wire (carlots)	16.50	17.50	16.25
Copper bars (ton lots)	19.50	22.50	19.50
Copper tubing (100-lb. lots)	23.75	24.50	23.00
Brass sheets (100-lb. lots)	17.75	19.50	18.75
Brass tubing (100-lb. lots)	21.50	22.50	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	16.25	17.50	15.75
Brass wire (carlots)	18.25	19.50	.....
Zinc sheets (casks)	8.50	9.00	.....
Solder (½ and ½), (caselots)	23.00	23.50	20.00
Babbitt metal (fair grade)	24.50	42.75	36.00
Babbitt metal (commercial)	11.12½	16.00	9.00
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	39.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.25	11.50
Copper, heavy, and wire	11.75	11.75	11.25
Copper, light, and bottoms	9.75	10.00	10.25
Lead, heavy	4.75	4.50	4.50
Lead, tea	4.25	3.50	3.50
Brass, heavy	7.00	6.00	9.00
Brass, light	6.00	5.25	6 25
No. 1 yellow brass turnings	6.50	6.25	6.75
Zinc	3.00	3.50	3.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11¼
Cotton waste, mixed, per lb.	.065@.10	.09	.08
Wiping cloths, 13½x13½, per lb.	.075	.10	.10
Wiping cloths, 13½x20½, per lb.	.08	.11	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.91	1.14	.97
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 100 lb. bag		.80	1 00
Coke, prompt furnace, Connellsville	per net ton	13.50@14.00	
Coke, prompt foundry, Connellsville	per net ton	15.00@16.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	45%	60%	50-10%
1½ and 1¼x3 in. up to 12 in	25%	65%	60-10%
With cold punched sq. nuts	30%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	.....	$4.00 off
Button head bolts, with hex. nuts	20%	$3.90 net	.....
Hex. head and hex. nut bolts	25%	.....	65-5%
Lag screws, coach screws	45%	.....	60-5%
Square and hex. head cap screws	75%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	35%	50-10-5%	50-5%
Bolt ends, with hot pressed nuts	45%	.....	55%
Tap bolts, hex. head, list plus	10%	.....	.....
Semi-finished nuts ⅜ and larger	65%	70-10%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.00	3.25	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.50	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.50	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	3.50	4.00
Rivets:			
Rivets, ⅞ in. dia. and smaller	55%	65%	60-10%
Rivets, tinned	55%	65%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$4.50	$3.50	$3.35
Cone heads, ditto (net)	4.60	3.60	3.45
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50-%
Copper burs	35%	50%	20%
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	30-5%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.40
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Conn., Hartford—E. C. Kiley, 766 Asylum Ave.—one small bench lathe (used).

Ill., Chicago—Continental Scale Wks., 2126 West 21st Pl.—one 6-spindle drill press, No. 1 or 2 taper.

Ill., Chicago—Robey Tank Wks., 2513 Robey St.—power pipe cutting machine to cut up to 4 in. (used preferred).

Kan., Wichita—Allen & Lee Mfg. Co., 521 Union National Bank Bldg., manufacturer of oil burners—drill press, lathe, belting, hangers, pulleys, shafting, bearings and emery grinder.

Kan., Wichita—The Guarantee Repair & Building Co., 1st and Waco Sts., J. B. Phillips, Purch. Agt.—power planer, wood lathe, drill press, iron lathe, and emery stand.

Kan., Wichita—W. Pearsons, 811½ North Main St.—one power lathe and drill press.

Kan., Wichita—A. Swenson, 829 North Main St.—one power lathe, emery wheel and stand for garage.

Kan., Wichita—D. E. Varner, 1617 South St. Frances Ave.—power wood lathe for making handles.

Kan., Wichita—Watkins Mfg. Co., 200 North Waco St., C. A. Watkins, Purch. Agt.—drill press, lathe, grinders, shafting, hangers, belting, pulleys, and pulley bearings, for the manufacture of automobile parts, for proposed factory at Syracuse, N. Y.

Kan., Wichita—Wichita Boiler & Machine Shop, Wichita and 1st Sts., A. McFarland, Purch. Agt.—one 24 in. iron power lathe.

Kan., Wichita—E. C. Wright (jeweler), c/o Dockum Drug Co., 400 East Douglas Ave.—power lathe for jewelry.

Mich., Detroit—J. R. Wood, 616 East High St., miscellaneous equipment for garage on West Warren St.

Mo., Kansas City—L. O. Mitchell, 713-15 Central St.—one power lathe, drill press, and complete set of hand tools for machine shop.

N. J., Newark—G. W. Heath & Co., 208 1st St.—automatic screw machine, $\frac{7}{16}$ in. capacity, for the manufacture of fountain pens.

N. Y., Brooklyn—Montauk Mfg. Co., 843 Union St.—drill press, saw table, small sander and lathe for the manufacture of phonographs.

N. Y., Buffalo—L. Cantor, 64 Manchester Pl.—tools and equipment for proposed brick and steel garage, at 122 Carroll St.

N. Y., Salamanca—T. E. Bargett, Wildwood Ave.—small tools, machinery and equipment for large addition to garage, machine and repair shops.

Pa., Bethlehem—The Bethlehem Steel Co—alligator shears.

Pa., Holland—The New Holland Machine Co.—rigid plain surface grinder with emery wheel not less than 18 x 3 in. or 24 in. sectional cup wheel suitable to surface hard chilled plates up to 18 in. square (new or used).

Pa., Phila.—J. West, 1118 South 54th St. (repair shop)—one key cutting machine, electric power.

Pa., Warren—Struthers Wells Co.—one 6 ft. boring mill.

Pa., Wilkes Barre—F. Goeringer—machinery and equipment for garage and repair shop on Main St.

Va., Richmond—The 18th St. Garage, 5 North 18th St., L. A. Huff, Purch. Agt.—one lathe and drill.

Va., Richmond—M. Hunter, (electrical contractor) 113 North 8th St.—lathes, drill press, and buffing machines, for proposed manufacturing and repairing department.

Va., Richmond—Richmond Motor Co., 10th and Broad Sts.—reboring machine and lathe.

Va., Richmond—Richmond Pressed Metal Wks., 6th and Stockton St., S. M. House, Purch. Agt.—lathes, punch and die machinery.

Va., Richmond — Rickerstaffs Repair Shop, 1811 East Main St.—lathes.

Va., Richmond—Standard Electric Co., 1821 East Main St.—emory wheels and frame, drill press and lathe.

Wis., Evansville — Schultz-Bray Auto Sales Co., W. F. Schultz, Purch. Agt.—repair machinery and air tank.

Ont., Listowel—McIntyre & Melrose—prices on tools and equipment for garage and auto repair shop.

Machinery Wanted

Calif., Escalon—C. V. Biggs—one newspaper press, job press, linotype and complete equipment.

Calif., Oceanside—The News—proof press and large perforating machine.

Conn., Bridgeport—Evening Star, Inc., 592 Water St., publishers—linotype machine.

Conn., New Haven—Mott Constr. Co., 440 Elm St., builders and mill work—woodworking machinery.

Ga., Atlanta—B. Miffin Hood Brick Co.—additional machinery for the manufacture of clay and brick products, for plant at Rome.

Ill., Chicago—M. O'Connor, 144 West Kinsie St.—good size air compressor, either belted or direct connected type.

Ill., Polo—Tri-County Press—one linotype and intertype machine.

Ia., Cedar Rapids—The Bd. of Educ., J. A. Moteje, Secy.—equipment for vocational and manual training departments of proposed Junior High School.

Ia., Cedar Rapids—The Mercy Hospital, c/o Sister Sephias, 6th Ave. between 8th and Division Sts.—laundry, refrigeration, and vacuum cleaning equipment for proposed addition to hospital.

Kan., Pittsburg—The New York Confectionery Co., Bway., one power beater, 5 ft. diam.

Kan., Wichita—Foose & Pence, 123 North Market St., manufacturer of shoes—leather working machinery, hangers, polishing machinery, pulleys and belting.

Kan., Wichita—Goodwin-Reser Printing Co., 412-413 Butts Bldg., F. Goodwin, Purch. Agt.—power job print stapler, and power perforating machine.

Kan., Wichita—Public Market Co., 124 West Douglas Ave.—one 8 ton ice machine.

Mass., Clinton—The Roubais Mills, Inc., 792 Main St., manufacturer of woolen cloth—steaming and brushing machine, (Curtis and Marble, used).

Mich., Grand Rapids—The Grand Rapids Tire & Rubber Co., Fuller St., H. F. Swan, Purch. Agt.—milling machine and rubber working machinery, etc.

Mich., Muskegon Heights—Solar Polar Storm Sash & Screen Co., J. J. Gillman, Mgr., c/o Brunswick-Balke-Collender Co., Muskegon—punch press, drill presses (radial and others).

Mo., Kansas City—W. Byers, 1st and Charlotte Sts.—welding outfit and cutting torches.

N. Y., Brooklyn—Thompson Dyeing Co., 219 36th St.—one 40 in. belt driven basket extractor.

N. Y., Buffalo—Air Reduction Sales Co., 730 Grant St.—machinery and equipment for proposed $20,000 air reduction plant.

N. Y., Buffalo—The Art Work Shop, 828 East Ferry St., manufacturer of art metal work and leather goods—machinery and equipment for proposed factory addition.

N. Y., Buffalo—Keystone Tool & Metal Co., 56 Oak St.—tool making machinery and equipment for proposed factory addition.

N. Y., Buffalo—Sikes Chair Co., 500 Clinton St., G. C. Dow, Mgr.—woodworking machinery.

N. Y., Buffalo — Wire Wheel Corp. of Amer., 1700 Elmwood Ave.—machinery and equipment for proposed $15,000 addition to wire wheel factory.

N. Y., Dunkirk—Skelton Shovel Co., c/o Chamber of Commerce—$135,000 worth of machinery and equipment for proposed factory, for the manufacture of shovels and tools of like character.

N. Y., Elmira—The Gravy-Brown Co., (manufacturer of extracts, etc.,) S. F. De Ved, Pres—machinery and equipment for plant at Canisteo.

N. Y., Jamestown — Jamestown Panel Co., 32-34 Steel St.—equipment and machinery for the manufacture of panels, etc.

N. Y., Jamestown—Watson Mfg. Co., 63 Taylor St.—machinery for the manufacture of steel window and door screens.

N. Y., New York—Kovat & Knauber, 800 Edgewater Rd., (iron works)—one air compressor, about 100 cu.ft. capacity, A.C.

N. Y., Philadelphia—Indian Chair Co., O. Liders, Pres. & Mgr.—additional equipment for chair factory.

N. Y., Rochester—The Northeast Electric Co., Whitney St.—machinery and equipment for large addition to factory, for the manufacture of auto electric systems.

N. Y., Rochester—C. Schlicker, 12 Bloomingdale St.—small machinery and equipment for the manufacture of surgical instruments.

N. Y., Tonawanda—The Spalding & Sons Co., Wheeler St., manufacturer of sporting goods—complete machinery and equipment for $200,000 factory now under construction.

N. C., High Point — Marietta Paint & Color Co., manufacturer of paint and products—machinery and equipment for 4 story factory now under construction.

N. D., Fargo—Pokodot Co., R. D. Savage, Mgr.—electric drier or sterilizer for a breakfast food.

O., Amherst—Hoynesite Powder Co.—machinery and equipment for the manufacture of blasting powder.

O., Columbus—The Columbus Sucker Rod Co., 525 West 1st Ave.—machine for making sucker rod joints, to take full length rods up to 25 ft.

O., Lancaster—Lancaster Lens Co.—one air compressor.

O., Lisbon—Pittsburgh, Lisbon & Western R.R., N. B. Billingsley, Genl. Mgr.—machinery for locomotive repair shop at New Galilee, Pa.

O., Minerva—The Owen China Co.—equipment for addition (11 kilns) to factory.

Okla., Commerce—J. F. Reitz (timber yard and planing mill)—woodworking machinery and saw mill.

Pa., Butler—Record Printing Co. (newspaper) — wire stitching machine, motor power.

Pa., Coraopolis—Standard Steel Spring Co.—special crane equipped with long hoisting drums and 2 hooks on 12 ft. centers, for lifting heavy plates.

Pa., Middletown—Middletown Ice Co.—complete machinery and equipment for proposed ice manufacturing plant, on Race St.

Pa., Norristown—Norristown Cigar Box Co.—one crosscut saw, 1 rip saw with frames.

Pa., Phila.—Fischers Hi Grade Dairy Co., North and Orthodox St.—sterilizers, steam vats, bottling machines, etc., for dairy.

Pa., Phila.—H. A. Haussmann, 1527 Germantown Ave.—full line tools and machinery for the manufacture of candy.

Pa., Phila.—F. W. Hosbach, 2415 South St., (woodworking)—additional woodworking machinery for new factory.

Pa., Phila.—Logan Ice Co., 10th and Windrim Sts., C. W. Roberts, Purch. Agt.—ice manufacturing machinery for new plant.

Pa., Phila.—T. J. Luttrell, 3726 Walnut St. (sheet metal and heating contractor)—additional metal working machinery for new shop.

Pa., Phila.—J. Schintzler, 2305 East Susquehanna Ave.—one printing press, Colts Armory, 14 x 22 in.

Pa., Phila.—Standard Provision Co., 212 North Front St., (meat packers) A. Rabinowitz, Purch. Agt.—conveyors, refrigerating machines, steam kettles, etc., for packing house.

Pa., Reading—Reading Hardware Co., 6th & Willow Sts., manufacturer of hardware and specialties—machinery and equipment for proposed 7 story addition to factory.

Pa., Stroudsburg—Pocono Food Products Co., 1st St.—refrigeration machinery and equipment for large refrigerator and fruit storage plant, now under construction.

Pa., Warren—J. T. Newell, 244 Penna. Ave., W.—complete machinery and equipment for proposed job printing plant.

Pa., Williamsport—Hermance Machine Co., 1st & Campbell Sts.—machine shop and machine manufacturer—equipment for pattern shop under construction.

Pa., Williamsport—The Stewart Artificial Ice Co.—machinery and equipment for ice freezing plant addition.

R. I., Providence—The Colwell Worsted Mills, 204 Hartford Ave.—one Kenyon two-bowl 72 in. crab, (used) in good condition.

Tenn., Chattanooga — The Browning Hosiery Mills, East Main St.—twenty-five 3¼-in. cylinder 176, 200, or 240-needle machines for hosiery work.

Tenn., Memphis—United States Fireworks Co.—machinery and equipment for proposed large addition to factory.

Va., Kenbridge—T. H. Allen—coal loading and conveying machinery.

Va., Richmond—H. A. Carter, 400 East Marshal St.—small corrugating machine to corrugate metal sheets 3 to 5 ft. long, for soda water fountain, etc.

Va., Richmond—Cussons, May & Co., 415 and 419 Bowe St.—tin binding machine for binding calendars.

Va., Richmond—Southern Steel Products Co., 4th and Bainbridge Sts.—bar benders.

Va., Richmond—Virginia Carolina Rubber Co., 10 North 19th St., R. A. Simpson, Purch. Agt.—mill for milling rubber, also colander machine.

Wis., Burlington—J. Abby & Sons—air compressor, gas storage tank, and pump, for proposed garage.

Wis., Cazenovia—Cazenovia Creamery Co.—machinery for the manufacture of dairy products.

Wis., Cudahy—The Federal Rubber Co.—special rubber working machinery.

Wis., Hartford—W. B. Place & Co.—one fleshing machine, 2 paddle vats, and 2 drums for tannery addition.

Wis., Kewaunee—Kewaunee Mfg. Co.—woodworking machinery and motors for proposed addition to factory, for the manufacture of laboratory furniture.

Wis., Milwaukee—J. Holly, 781 34th St.—one 20 to 30 in. band saw for woodworking.

Wis., Milwaukee—Seaman Body Corp., 1732 Richard St.—iron working and woodworking machinery for proposed auto body factory.

Wis., Milwaukee—Traffic Control, Inc., c/o A. J. Sweet, 531 Grand Ave.—electric drills for the manufacture of traffic control devices.

Wis., Nekoosa—M. J. Power—foundry equipment including cupola and furnace.

Wis., Peshtigo—Peshtigo Paper Co.—traveling crane.

Wis., Plymouth—The Phoenix Cheese Co., R. A. Harbach, Mgr.—refrigeration machinery of several tons capacity, steam power equipment of 300 hp., also special cheese-making equipment.

Wis., Racine—P. Meyer Mfg. Co., 407 Blaine Blvd., P. Meyer, Purch. Agt.—wood turning machinery for the manufacture of household utensils.

Wis., Stevens Point—Pfiffner Lumber Co., 229 Franklin St.—band saw.

Wis., Waukesha—Waukesha Lime & Stone Co., Route 7—limestone crushing machinery.

Wis., Wausau—Marathon Motor Car Co., 210 McClellan St.—machinery for auto repair shop.

Wis., Wisconsin Rapids—South Rudolph Co-operative Cheese Co., c/o I. Thompson, Route 2—cheese making machinery, vats and belting.

Ont., Byng Inlet—Graves Bigwood Lumber Co.—machinery and equipment for power house and planing mills damaged by fire and lightning to extent of $100,000.

Ont., Kincardine—Circle Bar Knitting Co.—prices on complete equipment for new dye house, including vats, tanks, and all general equipment.

Ont., Listowel—Ideal Manufacturing Co., G. A. McDonald, Mgr.—equipment for the manufacture of patent bread moulders, special tools and small electric motors in quantity.

Ont., London—The Coco Cola Co. of Canada, Edmonton, Alta., D. W. Hawkes, Mgr.—$50,000 worth of bottling and soft drink equipment for factory, here.

Ont., Neustadt—The Grey Furniture Co., J. C. Heuther, Mgr.—prices on woodworking equipment for proposed addition to factory.

Ont., Port Dover—Port Dover Spinning Co., H. S. Martin, Pres.—special equipment for the manufacture of sport cloths.

Metal Working Shops

Calif., Newman—The Newman High School Dist., R and Kern Sts., had plans prepared for the construction of a 1 story, 32 x 60 ft. shop. S. Wade, secy. F. W. Reid, East St., Concord, Archt.

Conn., East Hartford—Colonial Auto Co., 1279 Main St., Hartford, awarded the contract for the construction of a 1 and 2 story garage, showroom, and service station, on Connecticut Blvd. Estimated cost $40,000. Private plans.

Conn., Hartford—The Automatic Refrigerating Co., 618 Capitol Ave., awarded the contract for the construction of a 3 story 53 x 71 x 95 ft. addition to its plant, for the manufacture of refrigerating machinery. Estimated cost $50,000.

Conn., Norwalk—E. M. Jennings Co., 27 Harrison St., will soon award the contract for the construction of a 1 story, 55 x 155 ft. garage, automobile sales and service station, on West Ave. Estimated cost $40,000. J. W. Northrop, 211 State St., Bridgeport, archt.

Conn., Plainville—The Standard Steel Bearings, Inc., Railroad St., plans to build a large factory addition to its plant, 1 story. Private plans.

Ill., Chicago—Sloan Valve Co., 4300 West Lake St., is receiving bids for the construction of a 1 story, 39 x 132 ft. factory at 4336-40 West Lake St. Estimated cost $16,000. A. S. Alschuler, 28 East Jackson St., Archt.

Mass., Attleboro — The Hartley Clock Co., c/o Monks & Johnson, Archts., 99 Chauncey St., Boston, is having plans prepared for the construction of a 3 story, 60 x 240 ft. buildng. Estimated cost $125,000.

Mass., Boston—Druker & Rudnick, 18 Tremont St., awarded the contract for the construction of a 1 story garage, automobile sales and service station, on Harvard Ave. Estimated cost $75,000.

Mass., Everett — The Boston Elevated Ry., 108 Mass. Ave., will receive bids until Sept. 2, on sub-structure and foundations for two 160 x 300 ft., and two 53 x 56 ft. car repair shops, etc. D. P. Robinson, 61 Bway., New York City, Engrs.

Mass., West Springfield (Springfield P. O.) Wico Electric Co., c/o P. Brown, Pres., 44 Avon Pl., Springfield, is having plans prepared for the construction of four 1 story, 90 x 400 ft. buildings, here, for the manufacture of electric goods. Architect not announced.

Mich., Detroit—J. R. Wood, 616 East High St., awarded the contract for the construction of a 1 story, 90 x 120 ft. garage, on West Warren St. Estimated cost $40,000.

N. J., Trenton—Mercer County, E. E. Margerum, Dir. of Buildings, County House, plans to build a 2 story, 55 x 75 ft. garage addition, on Brunswick Ave. Estimated cost $35,000.

N. Y., Albany—The Electric Supply & Equipment Co., 103 Allyn St., Hartford, Conn., will soon award the contract for the construction of a 4 story, 40 x 63 ft. factory, for the manufacture of electrical supplies, appliances, etc., on Bway, here. Estimated cost $50,000. Private plans.

N. Y., Dunkirk—Skelton Shovel Co., c/o Chamber of Commerce, plans to build a factory for the manufacture of shovels and tools of like character. Estimated cost $125,000. Architect not announced.

N. Y., Jamestown—Watson Mfg. Co., 63 Taylor St., plans to build a 4 story addition to its factory for the manufacture of steel window and door screens. Estimated cost $24,000.

N. Y., Lockport—Dittmer Gear & Mfg. Co., Grand St., plans to build an addition to its factory for the manufacture of gears and gear products.

N. Y., New York—J. Arfman, 439 East 90th St., will build a 75 x 100 ft. garage on Ave. A. Estimated cost $100,000. Private plans.

N. Y., New York—H. Harjes, 408 West 76th St., awarded the contract for the construction of a 4 story garage at 403 West 76th St. Estimated cost $200,000. Private plans.

O., Cleveland—The Crucible Steel Castings Co., Canal Rd., awarded the contract for the construction of a 1 story, 100 x 280 ft. foundry, on West 82nd St. and Almira Ave. Estimated cost $100,000. W. H. Shepard, Pres. Noted Aug. 24.

O., Cleveland—Templar Realty Co., c/o M. Marmorstein, 605 Ulmer Bldg., awarded the contract for the construction of a 1 story, 52 x 86 ft. garage on East 69th St. and Euclid Ave. Estimated cost $40,000. Building to be leased to the Central Chevrolet Co., c/o A. B. Bashaw, Akron, O.

Pa., Charleroi—S. S. Jones, Belle Vernon, awarded the contract for the construction of a 2 story, 60 x 100 ft. garage on Donner and 9th Aves. Estimated cost $40,000.

Pa., Phila.—Henderson Bros., 25th and Spruce Sts., awarded the contract for the construction of a 2 story, 40 x 118 ft. and a 1 story, 30 x 115 ft. garage, on 27th and Bainbridge Sts. Estimated cost $100,000.

Pa., Pittsburgh — The Westinghouse Electric & Mfg. Co., East Pittsburgh, awarded the contract for the construction of a 4 story, 100 x 200 ft. manufacturing and storage plant, on Susquehanna and Lang Aves. Noted Jan. 26.

Wis., Beloit—J. Terwilliger, Clinton, is receiving bids for the construction of a 2 story, 75 x 135 ft. garage on Broad St., here. Estimated cost $50,000. Private plans.

Wis., Burlington—J. Abby & Sons, are receiving bids for the construction of a 1 story, 30 x 82 ft. garage. Estimated cost $40,000. M. F. White, c/o Wilbur Lumber Co., 908 Trust Bldg., Milwaukee, Archt.

Wis., Milwaukee—Seaman Body Corp., 1732 Richard St., awarded the contract for the construction of a 5 story, 100 x 225 ft. and 100 x 420 ft. auto body manufacturing plant. Estimated cost $350,000.

Wis., Neenah—Jaeger-Dowling Co., 214 South Commercial St., awarded the contract for the construction of a 1 story, 75 x 120 ft. garage. Estimated cost $40,000. Private plans. Noted August 10.

Wis., Waukesha—The Waukesha Fdry. Co., Lincoln Ave., has selected a site and plans to build a 2 and 3 story, 50 x 195 ft. steel factory and foundry. Estimated cost $50,000. Architect not selected.

Wis., Wausau—Marathon Motor Car Co., 210 McClellan St., awarded the contract for the construction of a 4 story, 60 x 120 ft. garage and service station. Estimated cost $75,000.

Ont., Listowel—McIntyre & Melrose have purchased garage and auto repair shop and will build an addition, also add another story to present building, and install hoist for handling cars to second story.

Ont., Niagara Falls—The Dominion Insulator Co. will build a 3 story, 80 x 350 ft. insulator factory on Portage Rd. Estimated cost $150,000.

General Manufacturing

Calif., Mountain View—Interstate Textile Mfg. Co., c/o W. Moser, Archt., Wells Fargo Nevada Bank Bldg., San Francisco, is having preliminary plans prepared for the construction of a group of factory buildings, here.

Calif., Richmond—The Luning Mineral Products Co. plans to build a plant for the manufacture of dry colors, on 21st St. Estimated cost $50,000. L. E. Brown, Pres.

Calif., Sacramento—The State Dept. of Public Wks. will receive bids until Sept. 11, for the construction of a 2 story, 160 x 160 ft. printing plant, on 11th and O Sts., here. Estimated cost $140,000. G. B. McDougall, Forum Bldg., Sacramento, State Archt.

Calif., San Francisco—U. S. Metal Products Co., 330 10th St., is having plans prepared for the construction of a 2 to 4 story manufacturing plant.

Calif., Santa Clara—Santa Clara News, awarded the contract for the construction of a 1 story newspaper publishing plant. Estimated cost $5,555.

Calif., Stockton—Xclusive Laundry, 427 East Lafayette St., awarded the contract for the construction of a 1 story, 92 x 150 ft. laundry on Lafayette and California Sts. Estimated cost $50,000. Noted July 27.

Conn., Bridgeport—Siemon Hard Rubber Corp., State St. extension, awarded the contract for the construction of a 1 story, 60 x 170 ft. factory addition. Estimated cost $30,000.

Conn., Hartford—The Acme Bedding Co., 94 Brown St., awarded the contract for the construction of a 2 story, 45 x 70 ft. bedding factory. Estimated cost $25,000. Noted July 27.

Ga., Rome—B. Miffin Hood Brick Co., Atlanta, has purchased plant of the Rome Fire-proofing Co., here, and plans improvements and additions. Estimated cost $75,000. Architect not announced.

Ill., Chicago—The Chicago Evening American, 325 West Madison St., is having plans prepared for the construction of a 3 story, 100 x 125 ft. printing plant at 210-14 South Peoria St. Estimated cost $175,000. P. Gerhardt, 64 West Madison St., archt.

Ill., Chicago—J. T. Igoe Co., 117 West Harrison St., awarded the contract for the construction of a 10 story, 100 x 150 ft. spinning plant on Van Buren and Jefferson Sts. Estimated cost $750,000.

Ill., Granite City—The National Enameling and Stamping Co., Federal Reserve Bank, St. Louis, Mo., is receiving bids for the construction of a 1 story, 84 x 788 ft. warehouse and manufacturing plant, here. United Engs. & Fdry. Co., Farmers Bank Bldg., Pittsburgh, Pa., Engr.

Ia., Cedar Rapids—The Bd. of Educ., J. A. Moteje, Secy., receiving bids and will open same about Sept. 20, for the construction of a 3 story, 160 x 200 ft. Junior High School, including vocational and manual training departments. Estimated cost $475,000. F. Tustison Co., 322 Auditorium Bldg., Minneapolis, Minn., Engr. B. Rugh, 811 Security Bldg., Archt.

Me., Portland—The Confederated Home Abbatoir Corp., is having plans prepared for the construction of a 4 story, meat packing, ice manufacturing and refrigeration plant. Estimated cost $300,000. Gorman & Brown Co., 357 Westminster St., Providence, R. I., Engrs. Noted June 15.

Mass., Dorchester (Boston P. O.)—The Tidewater Oil Co., 60 Cambridge St., Boston, is having plans prepared for the construction of a 1 and 2 story oil distributing and storage plant, on Dorchester Ave. Estimated cost $75,000. Private plans.

Mass., East Lee—The Mountain Mill Paper Co., Railroad St., awarded the contract for the construction of a 1 story 40 x 150 ft. and 40 x 50 ft. addition to its plant. Estimated cost $40,000.

Mass., Holyoke—The Farr Alpaca Co., Jackson St., awarded the contract for the construction of a 6 story, 100 x 500 ft. cotton warp plant. Estimated cost $600,000. Note July 27.

Mass., New Bedford—New Bedford Boiler and Machine Co., 42 Front St., will build a 4 story, 60 x 167 ft. warehouse. Estimated cost $150,000.

Mass., Watertown—The Hood Rubber Co., awarded the contract for the construction of a 2 story, 96 x 208 ft. addition to its factory. Estimated cost $75,000.

Mich., Grand Rapids—The Grand Rapids Tire & Rubber Co., Fuller St., will build a 3 story, 44 x 226 ft. factory. Estimated cost $250,000. H. F. Swan, Purch. Agt.

Mich., Muskegon Heights—Solar Polar Storm Sash & Screen Co., J. J. Gillman, Mgr., c/o Brunswick-Balke-Collender Co., Muskegon, is receiving bids for the construction of a 1 story, 30 x 80 ft. factory, here. Estimated cost $25,000. Private plans.

Minn., Minneapolis—The Northwestern Tire Co., 622 3rd Ave., S., is having plans prepared for the construction of a 2 story, 48 x 120 ft. sales and service station, on Harmon Pl., between 10th and 11th Sts. Estimated cost $50,00. Lund & Lunt, 224 Essex Bldg., Archts.

Minn., St. Paul—North St. Paul Casket Co., North St. Paul, awarded the contract for the construction of a 4 story, 95 x 150 ft. factory and office building on University Ave. and Briggs St. Estimated cost $92,750.

N. J., Trenton—The State, Court House, plans to build 2 shops on 3rd St., one for woodworking and the other for manufacturing concrete articles. Estimated cost $35,000. A. B. Mills, 142 West State St., Archt.

N. Y., Jamestown—Jamestown Lounge Co., 40 Winsor St., plans to build 3 small additions, including a dry kiln. Estimated cost $6,000.

N. Y., Jamestown—Jamestown Panel Co., 32-34 Steel St., plans to build an addition to its woodworking factory for the manufacture of panels, etc. Estimated cost $8,000.

N. Y., Long Island City—The National Liquid Bleach Co., 18 Purvis St., plans to build a factory on Foster Ave. between Honeywell and Buckley Sts. Estimated cost $500,000.

N. Y., New York—Kokem-Chisholm Co., 74 Center St., awarded the contract for the construction of a factory for the manufacture of barber supplies, on 134th St. and Willow Ave. Estimated cost $90,000.

N. Y., Rochester—The Northeast Electric Co., Whitney St., plans to build a 51 x 90 ft. addition, 25 ft. high, to its plant, for the manufacture of auto electric systems. Estimated cost $30,000.

N. Y., Rochester—Rectograph Co., 282 Hollenbeck St., plans to build an addition to its factory, for the manufacture of photographic appliances. Estimated cost $5,000.

O., Amherst — Hoynesite Powder Co. plans to rebuild portion of its powder plant destroyed by explosion.

O., Cleveland—D. D. Wessels & Son, 1385 East 17th St., manufacturer of sanitary tubs, awarded the contracts for the construction of a 2 story, 100 x 102 ft. factory and warehouse, at 2009 Oregon Ave. Estimated cost $50,000. Noted Aug. 24.

O., Columbus—Columbus Show Case Co., Grant Ave. and Buckingham St., awarded the contract for the construction of a 3 story, 82 x 382 ft. factory. Estimated cost $100,000.

O., Dayton—The Andrews Baking Co., 10 North Main St., plans to build a 2 story, 60 x 140 ft. bakery on 3rd and Charter Sts. Estimated cost $100,000. Architect not selected.

O., Dayton—Delco Light Co., North Taylor St., awarded the contract for the construction of a 6 story, 190 x 350 ft. factory, on East 1st St., for the manufacture of electrical apparatus. Estimated cost $600,000. G. B. McCann, Secy.-Treas.

O., Dayton—Miami Ice & Fuel Co., Ludlow Bldg., plans to build a 4 story, 60 x 160 ft. cold storage plant. Estimated cost $150,000. Architect not selected.

O., Minerva—The Owen China Co., manufacturer of china ware, plans to build an addition of 11 kilns to its present plant. Private plans.

Pa., Cambridge Springs—Blystone Mfg. Co., awarded the contract for the construction of a 90 x 260 ft. factory, for the manufacture of Blystone concrete blocks. Noted July 13.

Pa., Corry—The Kurtz Brass & Wood Bed Co., is having plans prepared for the construction of a 2 story, 100 x 150 ft. addition to its manufacturing plant. Private plans.

Pa., Phila.—Fischers Dairy, Orthodox and Worth Sts., awarded the contract for the construction of a 2 story, 40 x 61 ft. dairy, a 2 story 52 x 54 ft. stable, and a 16 x 31 ft. power house.

Pa., Phila.—J. T. Hockstra, Archt., 1713 Sansom St., is receiving bids for the construction of an ice cream plant, including four 1 story, 96 x 182 ft. buildings, for the Logan Ice Co., 10th and Windrim Sts. Estimated cost $150,000.

Pa., Phila.—Lutheran Publishing Co., 9th and Sansom Sts., awarded the contract for the construction of an 8 story, 74 x 117 ft. printing plant on 13th and Spruce Sts. Estimated cost $500,000. Harris & Richards, Drexel Bldg., Archts.

Pa., Phila.—Standard Provision Co., 212 North Front St., will open bids Sept. 1, for the construction of a 3 story, 60 x 90 ft. and 70 x 160 ft. packing house, on Callowhill and Willow Sts. Estimated cost $150,000. Private plans.

Pa., Warren—J. T. Newell, 244 Penna. Ave. W., plans to build a 4 story, 50 x 160 ft. job printing plant, on Liberty St. Architect not announced.

Pa., Williamsport—Stewart Artificial Ice Co., awarded the contract for the construction of a 1 story, 35 x 75 ft. ice plant addition on 1st St. Estimated cost $15,000.

R. I., Woonsocket—The Evening Call Publishing Co., 75 Main St., plans to build a 3 story mechanical building. Estimated cost $45,000. Private plans.

R. I., Woonsocket—French Worsted Co., Mill St., awarded the contract for a 1 story addition to its 5 story spinning mill. Estimated cost $40,000.

Wis., Cazenovia—Cazenovia Creamery Co. is receiving bids for the construction of a 1 story, 60 x 156 ft. dairy. Estimated cost $50,000. Private plans.

Wis., Cudahy—The Federal Rubber Co., awarded the contract for the construction of a 4 story, 120 x 250 ft. manufacturing plant. Estimated cost $250,000.

Wis., Green Bay—Fort Howard Paper Co., South State St., plans to build a 3 story, 100 x 140 ft. paper finishing plant. Estimated cost $200,000. Private plans.

Wis., Hartford—W. B. Place & Co., will build a 3 story, 60 x 60 ft. addition to its tannery. Estimated cost $30,000. Private plans.

Wis., Kewaunee — Kewaunee Mfg. Co., awarded the contract for the construction of a 2 story, 30 x 140 ft. factory addition for the manufacture of laboratory furniture. Estimated cost $45,000.

Wis., Madison—J. R. and E. J. Low, Archts., Strand Bldg., are receiving bids for the construction of a 1 story, 60 x 182 ft. factory on Charter St., for J. Feldman Paper Box Co., 515 Regent St. Estimated cost $60,000.

Wis., Plymouth—The Phoenix Cheese Co., is having preliminary plans prepared for the construction of a 5 story, 30 x 60 ft. factory addition, and also a 2 story, 30 x 60 ft. addition to present building. Estimated cost $60,000. R. A. Harbach, Mgr. Private plans.

B. C., Marpole—The Pacific Meat Co., 268 Columbia St., Vancouver, will build a 2 story, 65 x 100 ft. abattoir and cold storage packing plant, cattle sheds, etc., along the Frazer River, here. Estimated cost $80,000. H. Idsardi, c/o owner, Engr.

B. C., Vancouver—Canadian Pipe Co., Ltd., 550 Pacific St., plans to rebuild its wood pipe factory, recently destroyed by fire. Estimated cost $40,000 to $50,000. Engineer and Architect not selected.

B. C., Vancouver—The Dominion Government, Ottawa, Ont., awarded the contract for the construction of a 30 x 60 ft. grain drying plant, 90 ft. high, and a 1 story, 30 x 75 ft. boiler house, here. Estimated cost $85,000.

Ont., Neustadt—The Grey Furniture Co. plans to enlarge its factory and install additional machinery and equipment. Estimated cost $35,000. J. C. Heuther, Mgr.